ANNALS OF SURGERY

ORIGINAL MEMOIRS.

A CASE OF MALIGNANT ŒDEMA.

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THE bacillus of malignant œdema (Koch) or the vibrion septique (Pasteur) has been thoroughly studied experimentally. This bacillus is common in garden earth, from which it is easily obtained by animal inoculation. The clinical picture of this infection in the human being is not often recognized, owing to its confusion with infection by the bacillus ærogenes capsulatus of Welch. For this reason, it is of importance to record a case of emphysematous gangrene known not to be caused by Welch's bacillus. Cases of malignant œdema have been occasionally reported, but only a few with sufficient bacteriological proof that they are due to infection with the bacillus of malignant œdema rather than with other bacteria. The writer has not been able to find an authentic case in English literature, and only five cases in the literature of the world.

The five cases in which the infecting bacillus seems to have been proven to be the bacillus of malignant œdema are as follows:

1. Giglio describes a case of an abscess in the pouch of Douglas. Cultures and animal experiments showed the presence of the malignant œdema bacillus in the pus.

2. Menereul's case was an insane woman who drank some infected fluid. This was followed by intestinal symptoms and by gaseous gangrene of the inside of the left thigh. Cultures taken at the autopsy showed malignant œdema bacilli in the blood and organs. Animal experiments were positive.

3 and 4. Hämig and Silberschmidt report two cases. The first was a compound fracture of the left forearm, said to have been carefully cleaned with an antiseptic at the time of the injury. The patient died of sepsis. Two organisms were found in this case,—the bacillus of malignant œdema and the bacillus coli communis. This is rather a doubtful case, since the liver and other organs contained more gas than is caused by malignant œdema alone. It is possible that a combination of the two organisms might cause this condition. The second case was a compound fracture of the elbow and wrist-joints. In this case the streptococcus pyogenes and the bacillus of malignant œdema were found. In both of these cases cultures were positive.

5. Witte. A case of pyosalpinx with bloody gaseous exudate. Malignant œdema bacilli were demonstrated in the left oviduct by animal experiments and cultures.

Besides the above five cases, three more cases may be mentioned, because they are commonly cited as true cases of malignant œdema; but the writer feels that their bacteriological proof is insufficient.

1. Braatz describes an abscess of the neck in which bacilli resembling malignant œdema bacilli were found under the microscope. No cultures are mentioned.

2 and 3. Briger and Ehrlich describe two cases of typhoid fever, in both of which gaseous gangrene supervened after the subcutaneous injection of musk. The identity of the organism was not proved by cultures in either case.

The following case entered the service of Dr. J. Collins Warren, at the Massachusetts General Hospital, November 27, 1902. The patient was an Italian laborer, forty-nine years of age, who, six days before his entrance, had been caught between

an elevator and a wall. A lacerated wound of the right heel
was sustained which required two stitches. Two days later the
patient came under the care of Dr. Homan, who found the wound
septic. The edges of the wound were gangrenous and some-
what swollen with gas. The wound was cleaned with peroxide
of hydrogen and poulticed. Twenty-four hours before his ad-
mission to the hospital, the swelling extended around the ankle
and had commenced to spread up the leg. Upon reaching the
hospital, an examination showed the posterior aspect of the right
heel to be covered by an irregular black eschar, occupying an
area three inches long by two inches wide. In the middle of
the diseased area was found a lacerated opening through which
exuded foul-smelling, bloody pus. No redness or œdema were
present below the ankle-joint or on the dorsum of the foot.
Above the ankle for six to eight inches, along the back of the
leg, redness, induration, and œdema were noted, while crepita-
tion could be plainly felt about the ankle itself. The glands in
Scarpa's triangle and in the groin were enlarged, but were not
tender. Temperature, 102° F.; pulse, 100; respiration, 25;
white count, 13,000; urine, normal. The man refused opera-
tion, and during the night the emphysema extended up the leg
to within two inches of the tuberosity of the tibia, in front, and
to within three inches of the popliteal space, behind. The pos-
terior aspect of the leg was black and mottled, while the anterior
aspect was covered with yellow and blue streaks. The œdema
extended over the ankle and the dorsum of the foot. The tem-
perature in the morning was 99° F.; pulse, 80. The man finally
consented to an operation, and an amputation at the knee-joint
was accordingly done by Dr. Warren. The temperature re-
mained elevated to 100° or 101° for six days; afterwards it
subsided to normal. The wound healed well with the exception
of the anterior flap, in which a small portion of the discolored
tissue had been included. After the separation of the slough,
no further trouble occurred. Twenty-four days after the opera-
tion, the patient underwent a mild attack of pneumonia, the
temperature again reaching normal on the thirty-fifth day. The
patient was discharged well.

    Bacteriological Examination.—Cultures made from the dis-
eased tissue of the amputated leg showed the presence of an
obligate anaërobic spore-bearing bacillus, in addition to other

bacteria. It will be seen from the description of this bacillus, given below, that it corresponds, in morphological and cultural peculiarities, and in pathogenic effect upon guinea-pigs, with the bacillus of malignant œdema. The bacillus ærogenes capsulatus of Welch was sought for, but was not found.

The bacteriological study of this case was made under the supervision of Dr. J. H. Wright, Director of the Clinico-Pathological Laboratory of the Massachusetts General Hospital.

Description of the Bacillus.—This bacillus is about 0.75 micron thick, and has square or rounded ends. It occurs singly, in chains and in long filaments, and is provided with numerous flagella which project from its ends and sides (Fig. 2).

The bacillus forms oval spores, which appear usually in the middle, though occasionally towards one end of the rod. The spores are thicker than the body of the bacillus (Fig. 1). The spore formation is best seen in gelatin and in bouillon cultures.

The behavior of the bacillus towards Gram's stain is not constant. In cultures, some of the bacteria partially decolorize, others completely, others not at all. In the animal recently dead of infection with the bacillus, none of the bacteria in the peritoneal exudate decolorize. It would seem that this inconstant behavior towards the Gram stain is dependent upon degeneration of the organism.

The bacillus is motile. The motility is not demonstrable in the bacilli from cultures, but is easily made out in the blood and in the peritoneal exudate of animals dead of infection with the bacillus. The motility persists for some hours.

The bacillus is an obligate anaërobe, and grows on most of the usual culture media, both in the incubator and at room temperature. It ferments glucose with the production of gas. The growth in various media is best at reactions varying from 0 to + 1. (Scale of the American Public Health Association.)

Cultures and animals dead of infection with the bacillus have a peculiar putrefactive odor.

Cultures.—In 1 per cent. glucose agar suspension culture, after twenty-four hours, colonies appear in the lower three-quarters of the medium, consisting of indefinite fuzzy masses which may attain a diameter of two or three millimetres. No growth ever occurs in the superficial layers of the tube (Fig. 5).

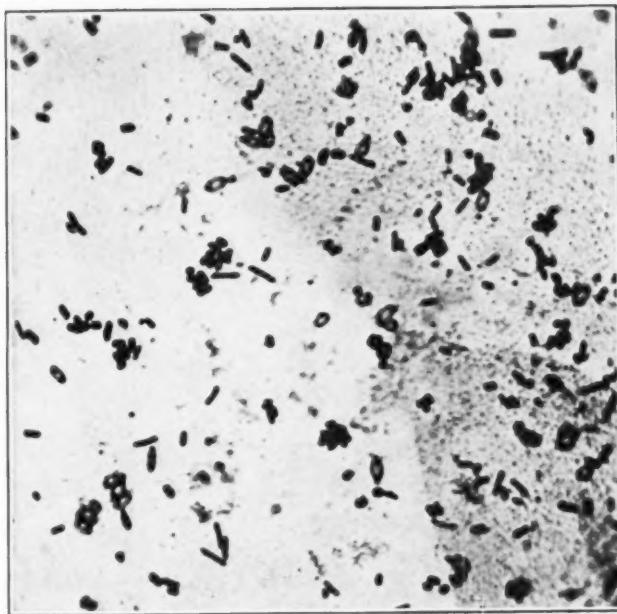Under the microscope, the colonies appear to be made up of

FIG. 1.—Spore formation. × 1500.

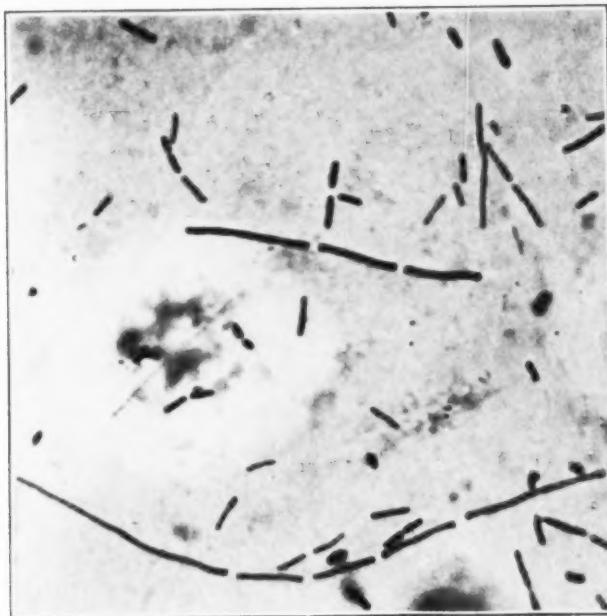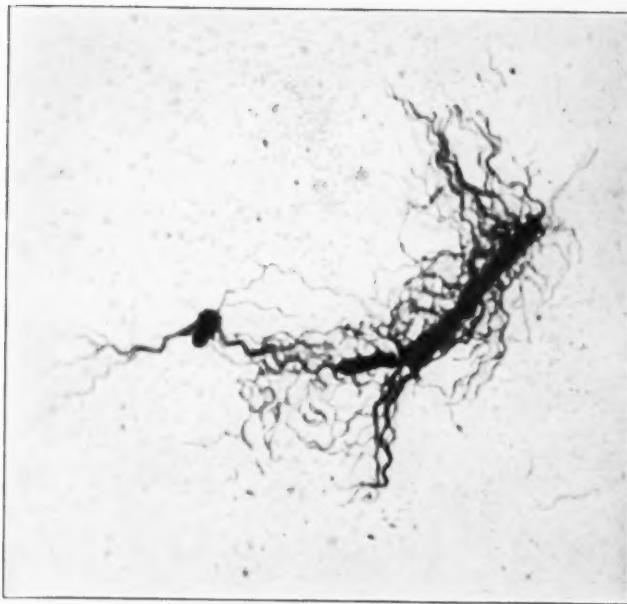FIG. 2.—Long and short forms.   Variation to the Gram stain.   × 1500.

FIG. 3.—Flagella. Stained by Williams's method. × 2000.

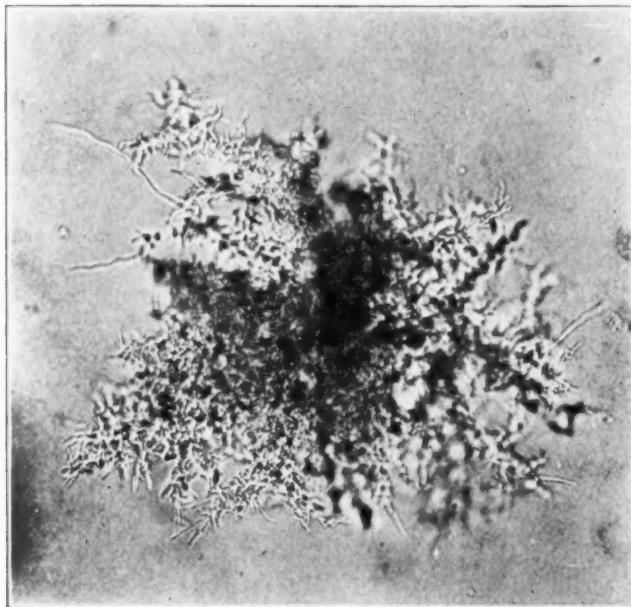FIG. 4.—Colony in glucose agar. Low magnifying power.

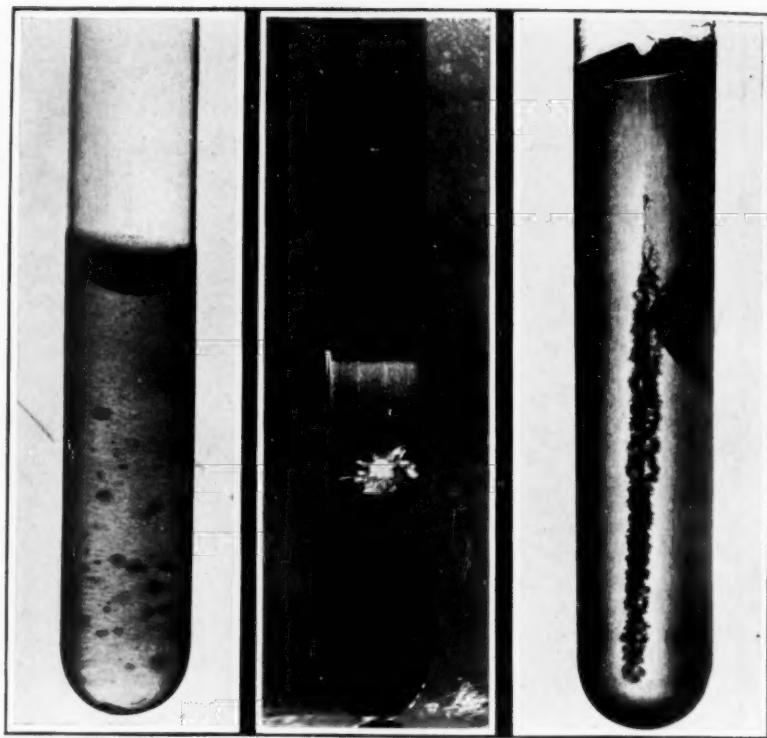FIG. 5.—Suspension culture.　　Large colony in　　Stab culture,
　　glucose agar.　　　　　glucose gelatin.　　　glucose agar.

a dense mass of long and short filaments disposed in a more or less radiate manner at the periphery (Fig. 4).

In 1 per cent. glucose agar stab culture, after twenty-four hours, a grayish streak appears in the lower three-quarters of the tube along the line of inoculation, with numerous short, fuzzy, lateral outgrowths. These outgrowths increase somewhat in size, but never extend as far out into the medium as those of the tetanus bacillus. Gas forms in the medium. Spore formation is slow.

One per cent. glucose gelatin suspension cultures. The appearance of the colonies in gelatin varies in different cultures. At room temperature, after three to six days, the colonies appear as more or less globular, grayish, liquefied areas in the gelatin. At the margin of these liquefied areas filamentous outgrowths may be seen under low magnifying power radiating into the surrounding gelatin. Occasionally these filamentous processes continue to grow until they develop into long, thick projections, at the ends of which are situated new foci of liquefaction.

In 1 per cent. glucose bouillon under anaërobic conditions (Wright's method), after eighteen to twenty-four hours, the bouillon becomes turbid, and gas is constantly liberated. After twenty-four to forty-eight hours, the growth settles to the bottom of the tube as a thick, white, ropy mass. Spore formation is rapid.

On potato, rendered as nearly neutral as possible by treatment with dilute sodium hydrate solution and under anaërobic conditions by Wright's method, no growth is visible.

On coagulated blood serum, under anaërobic conditions by Wright's method, no growth is obtained.

In milk under anaërobic conditions by Wright's method, after twenty-four hours, a dark gray mass settles to the bottom of the tube. In this mass many bacilli are to be found. Forty-eight to seventy-two hours after inoculation, a marked coagulation of the milk occurs.

Pathogenesis.—The bacillus was found to kill guinea-pigs within eighteen to twenty-four hours after subcutaneous inoculation. The characteristic lesions in the guinea-pigs were: subcutaneous hæmorrhagic œdema, serous exudation in the pleural and in the peritoneal cavities, and moderate subcutaneous gas formation. The organism was found in the fluids of the sub-

cutaneous tissue, peritoneal and pleural cavities, blood and spleen.

The photomicrographs accompanying this paper were made by Mr. Louis S. Brown, of the Clinico-Pathological Laboratory of the Massachusetts General Hospital.

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FATAL HÆMORRHAGE FROM TREPHINING.[1]

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It is generally considered that the operation of trephining *per se* is devoid of danger. The removal or temporary lifting of a considerable portion of the skullcap for purposes of exploration is undertaken without thought of involving life. It is believed that in direct proportion to the extent of the intracranial portion of an operation is the danger of serious hæmorrhage and shock increased. This is borne out by statistics. Thus, in the compilation of Haas of 122 operations for brain tumor, which were successful as regards the removal of a tumor, there was a mortality of 61 per cent. The death-rate is largely charged to shock and hæmorrhage.

In the two years 1900 and 1901 von Bergmann operated on four tumors with three deaths directly due to operation. That the hemicraniotomy, the opening of the skull by the large trap-door method, and the operating at one sitting are in part accountable for this high death-rate is probable. In the larger work of von Bergmann on brain surgery twelve deaths had been reported directly due to hæmorrhage. It is difficult to determine the proportion of cases in which excessive hæmorrhage came from the skull. Of 175 exploratory or palliative operations in which the tumor was not found or could not be removed, seventy-five ended fatally.

In the literature of the subject, deaths on the table have been often recorded without specific designation of the source of the bleeding. In brain tumors involving the dura and the bone capsule, excessive bleeding is to be expected. That changes in the diploic veins should occasionally take place is not strange, when one considers the relationship between the dural sinuses, the cortical meningeal veins, and the parasinoidal

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spaces as demonstrated by Cushing. In a personal communication from Dr. William Taylor, he states that he has seen only two of Dr. Keen's cases of dural tumor survive the operation. Hæmorrhages carried off the other cases in the course of a few hours.

In a personal communication from Dr. Allen Starr, he reports a case operated upon at the Presbyterian Hospital for supposed cerebellar tumor. On stripping off the scalp, a large horseshoe incision having been made over the occiput, the hæmorrhage was severe. When the pericranium was exposed, a series of little holes in the skull was opened, from which venous blood poured out. The diploic veins connected with the lateral sinus. They were enormous and opened outward. The operation was discontinued, the hæmorrhage being controlled with difficulty by pressure. The patient recovered from the operation, but did not report subsequently.

In another case at the New York Hospital, Dr. Peabody exposed a fibroma, one inch beneath the cortex of the parietal region. Over this tumor the skull was reduced in thickness, so that it was not one-eighth of an inch thick over a region two inches in diameter. Here the man had felt pain, and the skull was exquisitely tender. But one inch of brain tissue of apparently normal consistency lay between the tumor and this thin skull. Dr. Starr further states that he has seen two cases of brain tumor in which the skull over the growth was thicker than elsewhere.

So far as my knowledge of the literature goes, no great changes in the skull have been depicted as secondary to subdural brain tumors, except for the involvement of the dura and overlying bone from extension of the disease. The following case of death from hæmorrhage from the bone only, and a description of the changes found on autopsy, may prove of interest.

Miss A. M.; aged thirty years; single. Entered Cincinnati Hospital December 22, 1902. The family history is negative. The patient has been well up to the present time, except for an

FIG. 1.—Radiograph showing enlarged parasinoidal spaces and parietal branch of anterior diploic veins.

FIG. 2.—Radiograph of opposite side of skullcap.

attack of measles in childhood. Two years before admittance,
patient began having epileptic seizures, in which the right arm
would begin to tremble and contract. Then the right side of the
face and the right leg would become rigid and tremble. The
patient usually lost consciousness. These attacks occurred on an
average of once a week. She was brought to the hospital several
months ago, and the diagnosis of tumor in the left cortex was
made. The patient refused operation and left the hospital. The
fits continued to occur weekly.

Present Condition.—Patient of small stature, fairly developed
and well nourished. On the face there is a typical iodine erup-
tion. Heart sounds normal. Mentally the patient is fairly bright,
but at times shows marked hebetude. She complains of almost
constant headache. Movements of the eye normal. Reflex pres-
ent both to light and accommodation, otherwise the examination
is negative. The ophthalmoscopic examination made by Dr.
Sattler shows typical papillitis, prominent swelling of optic-nerve
entrance with exudation and hæmorrhage, œdema of the disc,
œdematous infiltration of region of macula; likewise slight hæm-
orrhage. The papillitis, which has been present for a length of
time, is beginning to recede and give way to optic atrophy.

During her stay in the house, a number of epileptic seizures
were carefully observed. They began with pain in the right arm,
which was a precursor of the attack. Within five minutes usually
the pain increased, and the arm became rigid and trembled. The
face and right lower extremity were next involved and became
rigid. In a number of attacks, unconsciousness lasting for a
varying length of time followed. During the attacks the pulse-
rate increased to 120, but within an hour after its termination it
was down to eighty-four.

Operation, January 28, 1903.—Morphia chloroform narcosis.
The Rolandic fissure having been outlined, a large horseshoe-
shaped incision of the scalp with lower base was made down to
the bone. The bleeding from the scalp was not unusual. With
the Kümmel electric drill, an opening was made through the skull.
The bleeding was quite profuse. The smallest Sudek's fraise
was next inserted, with a view of making an osteoplastic resec-
tion of the skull in the line of the scalp incision. About one inch
of bone had been cut through, when it was evident that the pro-
fuseness of the hæmorrhage from the bone would prevent the

completion of the operation by this method. The fraise was therefore removed, and bone wax was pressed into the line of the cut in the bone. The hæmorrhage was not thereby controlled. Compression of both carotids was likewise tried, but was of no avail. As speedily as possible, a large trephine opening was then made, the scalp and periosteum having been rapidly lifted from the bone. With rongeur forceps the bone was removed as rapidly as possible, in order to get at the source of the bleeding. In the mean time, the patient became blanched and pulseless. She died after the dura was exposed. The autopsy revealed a gliosarcoma the size of a small peach directly under the trephine opening. The tumor could easily have been lifted out from between the convolutions. It was not adherent to the dura. The original intention to operate at two sittings was frustrated by the death on the table from hæmorrhage from the bone. The skullcap was removed, and the following changes noted by Dr. A. V. Phelps, Professor of Anatomy in the University of Cincinnati (Fig. 3), who was kind enough to make a very careful study of the effects on the bone of the marked disturbance of the intracranial venous circulation.

Report of Dr. Phelps.—" The groove for the lodgement of the superior longitudinal sinus, anterior to a point midway between the lambdoid and coronal sutures, is much widened, being four centimetres wide on the frontal bone, where it should be a mere trace. The margins of the groove are scalloped, showing where the much distended lacunæ laterales of Keys and Retzius pressed upon the bone.

" Posterior to the point above taken and almost opposite to the posterior pole of the trephine opening, the groove for the longitudinal sinus abruptly narrows, being one centimetre, and appears normal. Anterior to the transverse plane of the above point, lateral to groove and in the groove for the sinus, are numerous openings, greatly enlarged foramina, through which the dural veins and the diploic veins anastomose.

" The most remarkable changes, however, are the bony canals for the diploic veins. This change is almost limited to the left side, the side of operation. Remembering that the occipital diploic veins are much the largest, and noting that in the specimen they are normal, their opening may be used as a standard of comparison.
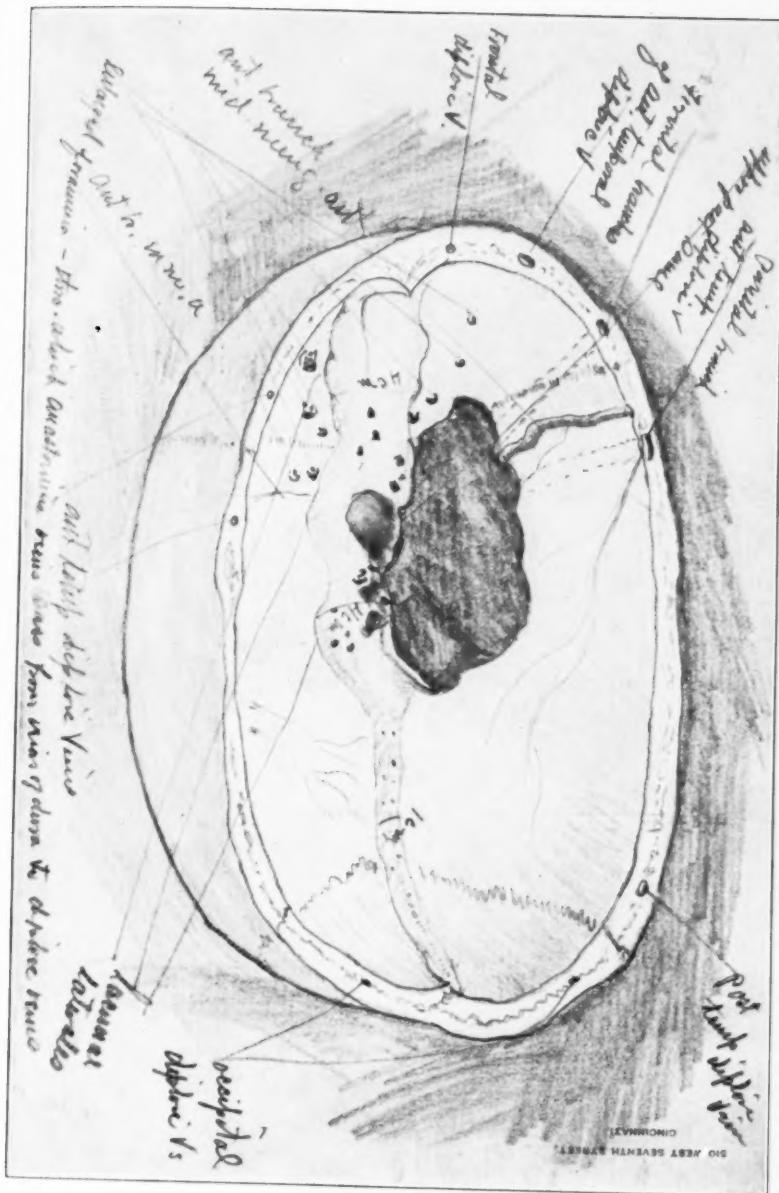
FIG. 3.—Inner surface of skullcap. (Phelps.)

" 1. The frontal diploic canal of the left side, usually very small, is as large as the occipital.

" 2. The canals carrying the frontal branches of the anterior temporal diploic veins are two millimetres in diameter, and appear to be five times as large as the occipital. The bony tables over them are so thinned that one can trace the canals. They open on the edges of the trephine opening.

" 3. One canal, the parietal branch of the anterior temporal diploic vein, is five millimetres in diameter, and appears to be ten to twelve times as large as the occipital. Its coverings are almost transparent, and it opens directly in the margin of the trephine opening, having crossed the field of operation.

" 4. The posterior temporal diploic canal is about four times as large as the occipital.

" 5. On the right side, only the temporal canals for diploic veins are enlarged, and to about the size of the normal occipital only.

" About opposite the middle of the trephine opening and just to the left of the sagittal suture, the bone is so thinned as to be transparent. It would appear that the growth interfered with the flow through the superior longitudinal sinus, and the veins of the dura and their lacunæ laterales became distended. The anterior temporal diploic vein anastomoses with the dural veins, and empties by coming out through the great wing of the sphenoid, entering one of the deep temporal veins. It would appear that this great diploic vein became the principal channel of collateral circulation.

" The left diploic veins were more enlarged, because the dural veins with which they anastomosed were directly pressed upon as well as the sinus. Fewer of the meningeal veins anastomosing with the posterior temporal diploic vein were pressed upon, therefore its enlargement is less than that of the anterior. It empties either through the mastoid opening or goes inward to the lateral sinus."

These changes in the blood channel of the diploe are shown in the accompanying illustrations (Figs. 1, 2, and 3).

In the case reported, the first symptoms manifested themselves two years before the operation. The growth, therefore, was rather rapid in its development, and therefore marked

changes in the diploic veins must be considered as very un-
usual.   From the very nature of things, it is impossible to pre-
dict such a complication in a contemplated operation for brain
tumor, except when it is evident that dural tumors have infil-
trated the bone.   In these cases hæmorrhage is to be expected.
That the increased general intracranial pressure from clearly
subdural tumors, as in the above case and that mentioned by
Starr, is capable of inducing marked dilatation of the diploic
veins and the parasinoidal lacunæ must be borne in mind.   It
certainly accounts for the greater·hæmorrhage during the
operation of trephining for tumor than for other pathologic
conditions.

The case presented was the first in which I attempted the
use of the electric fraise, with the intention of doing an osteo-
plastic resection.   While it is impossible to be certain that the
result would have been different had I adopted the older meth-
ods of operating with trephine and chisel, I am quite certain
that valuable time was lost in getting at the source of the bleed-
ing.   Posture of the head and compression of the carotids
availed nothing.

In a few cases recorded, among them one of my own, the
ligation of the carotid was made necessary by the profuseness
of the bleeding.   It is difficult to see how, in a case like the one
recorded, anything short of tying both carotids would have
availed.   This patient was dead from hæmorrhage before the
carotid could have been exposed.

NOTES ON A CASE OF FUSIFORM ANEURISM TREATED BY MATAS'S METHOD.

## BY ROBERT T. MORRIS, M.D.,

OF NEW YORK.

In the ANNALS OF SURGERY for February, 1903, Dr. Rudolph Matas described a new method for the treatment of aneurism based upon arteriorrhaphy, and the fact that the endothelial surface of the artery is " capable of exhibiting all of the reparative and regenerative reactions which characterize the endothelial surfaces in general when subjected to irritation."

The first case which seemed to offer an opportunity for the application of the method for constructing a channel through the aneurismal sac came under my care in May, through the kindness of Dr. H. P. Geib, of Stamford, Connecticut. The patient was a strong, robust man, G. H., fifty-eight years of age, who had been in the habit of sitting, when reading, with the right leg over the arm of his chair. He noticed that this often caused pain in the popliteal region, and he had apparently caused sufficient traumatism of the popliteal artery to endanger the integrity of its coats. No other part of his history seemed to have a bearing in the case. During the past four years a swelling in the right popliteal region had been increasing, until at the time when I first saw the patient the aneurism was so large that its pulsations were visible on both sides of the knee, when viewed from the patellar side. Lymph stasis in the leg was so marked in degree that the leg was tense and swollen, although it had been tapped several times to allow the œdema to subside. It seemed to us that a ligation of the femoral artery would be particularly dangerous in the case, on account of the condition of the blood- and lymph-vessels of the leg; and it was decided to attempt to give relief by the Matas method. The operation was performed at the patient's home in Sound Beach, Connecticut, on May 16, 1903, Drs. H. P. Geib, G. W. Birch, and L. W. Munson assisting. The

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leg was prepared with a germicidal depilatory a few minutes
before operation, and, as an incidental note, it may be stated that
this method, which avoids the necessity for shaving and ster-
ilizing by more elaborate measures, simplified the process of
making the skin aseptic in a most satisfactory way.   One can
accomplish in five minutes with a germicidal depilatory all that
is accomplished in several hours of preparation by the cumber-
some methods at present in vogue; and in a case of this sort, in
which a very large area needed to be sterilized, the advantages
of the method were much in evidence.

An elastic bandage was applied from the foot to the thigh,
and secured at a convenient point above the site of the aneurism.
An incision ten inches in length was carried longitudinally
through the tissues of the popliteal space, and this included the
wall of the sac of the aneurism.   A double handful of clots was
removed from the sac, and the aneurism was determined to be of
the fusiform type, with a large, thin-walled diverticulum which
constituted the chief part of the mass.   With No. 1 chromicized
catgut a running suture was carried through the tissues of the
deepest part of the sac in such a way as to construct something
more than three inches of new artery of a caliber estimated to be
similar to that of the normal artery, and a second row of sutures
was introduced for fortification.   The remainder of the sac was
left undisturbed and still adhering to its surroundings.   The new
artery was held between my fingers when the elastic bandage was
removed from the thigh, and it was a moment of considerable
interest.   Pulsation bounded through the new artery, and it did
not leak at any point.   The patient's foot became warm, but it
was not possible to find pulsation in the arteries of the foot, on
account of the tension of the œdematous tissues.   The wound
was closed without drainage, and it healed completely by primary
union.   The swelling of the leg began to subside immediately
after the operation, and assistance was given by massage admin-
istered by the trained nurse, who remained constantly near the
patient for the first few days.

Paralysis of sensation and of motion which had resulted
from the presence of the aneurism began to disappear shortly
after the operation.   Sensation was well defined over the right
leg and foot by the seventh day.   By the twenty-second day, when
the patient was first allowed to sit out of bed, the only important
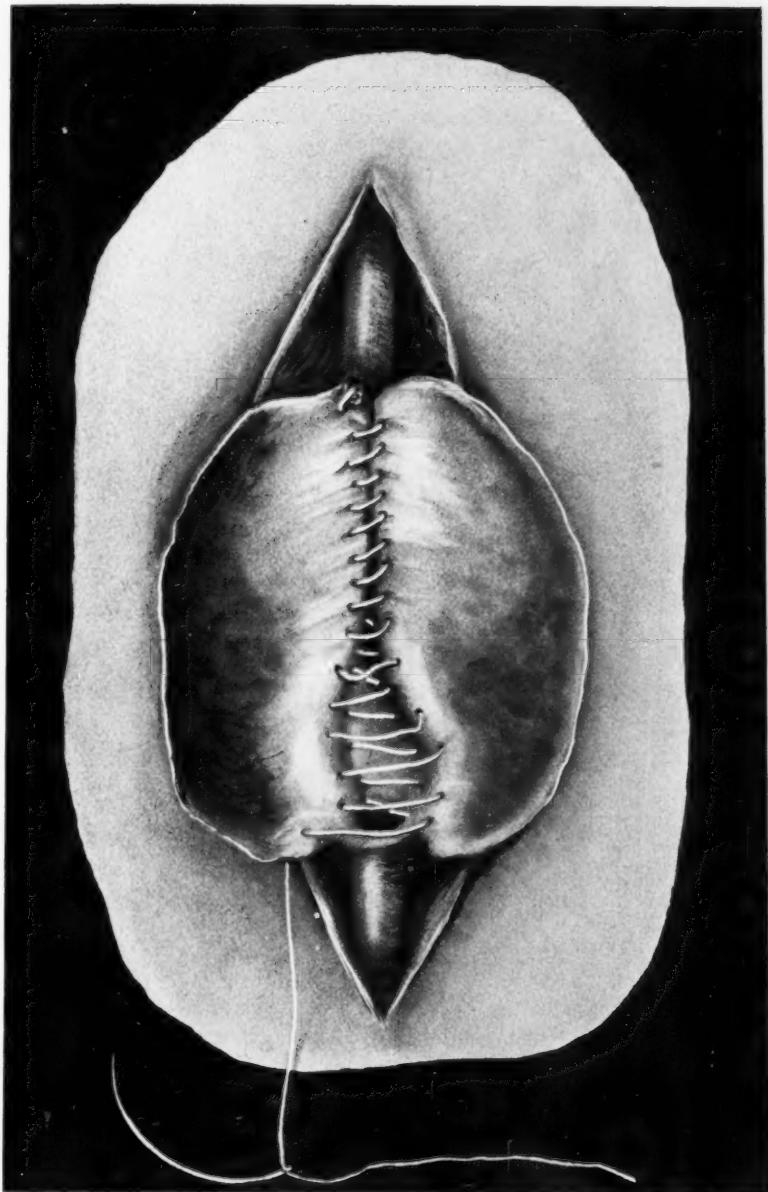
Suture of aneurismal sac in case of fusiform aneurism of the popliteal artery.

paralysis of motion remaining involved the anterior tibial group
of muscles, and this is improving under treatment. On the
twenty-second day the site of the aneurism was carefully exam-
ined for the first time. The newly constructed artery gives the
impression of being larger than the popliteal artery of the left
leg. Whether this is due to the thicker walls of the new artery,
or whether I did not estimate quite closely enough on the caliber
of the normal artery, it is difficult to say. In any event, the
restoration of function is satisfactory.

Dr. Matas writes, " I am very glad, indeed, that you have
been able to put this method to a practical test, as I had only
suggested it without having had an opportunity to apply it in
fusiform aneurisms. In all my cases of this type, I had limited
my intervention to a simple closure of the orifices by suture and
obliteration of the sac by infolding of its walls with the over-
lying skin."

In this particular case it was impossible to carry out Dr.
Matas's plan of infolding the walls of the sac for extra pro-
tection, because the tissues of the popliteal space were so
œdematous.

I regret that Dr. Matas's method had not been described
at the time when my case of ligation of the abdominal aorta
for aneurism was in hand. (Reported in ANNALS OF SUR-
GERY, February, 1902.) In that case the walls of the aneurism
could have been sutured for the construction of a new artery
quite as readily as the work was done in the case of popliteal
aneurism. I shall watch for an opportunity to try the Matas
method in a case of carotid aneurism, and believe that in
selected cases we may be able to carry the blood temporarily
through a rubber tube with glass ends inserted through normal
artery walls above and below the site of the aneurism during
the time when a new artery is being constructed out of the
walls of the aneurismal sac, if the case does not permit control
of the circulation by pressure.

ON AN AGGRAVATED CASE OF ANEURISMA RACEMOSUM.

BY CARL BECK, M.D.,

OF NEW YORK,

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Visiting Surgeon to the St. Mark's Hospital and the German Poliklinik.

THE extent of the vascular growth in the case presented must
be regarded as extraordinary. Seventeen years ago the patient,
a man of thirty-two years, noticed a small elevation of the skin,
two months after he had been struck by a stone in the centre of
his forehead. The small tumor grew constantly until it extended
over the hairy scalp, the forehead, the temporal region, the nose,
and the eye (Figs. 1 and 2). The soft, irregular tumor pre-
sented a bluish and reddish-blue appearance in some portions,
while others were normal. The overlying skin was thinned and
adherent. Pulsation was quite marked, and on auscultation a
soft, intermittent murmur could be perceived. Digital pressure
upon the peripheral blood-vessels had but little effect on the pul-
sation; even compression of the carotid diminished the pulsation
but slightly. The pulsation of the tumor annoyed the patient
considerably, and lately there were frequent attacks of dizziness.
The most prominent portion of the tumor had burst twice during
the last year, the hæmorrhage being excessive at each time.

Six weeks ago I ligated the temporal arteries (first), and
four days later the frontal and angular arteries (Fig. 3). These
procedures were followed by a slight diminution in the size of
the tumor and lessening of the pulsation. Five days after the last
ligation the extirpation of the tumor was undertaken. It was
preceded by an interrupted prophylactic suture, carried around
the normal tissues adjoining the tumor. In addition, an assistant
used digital pressure, while the process of removing the tumor
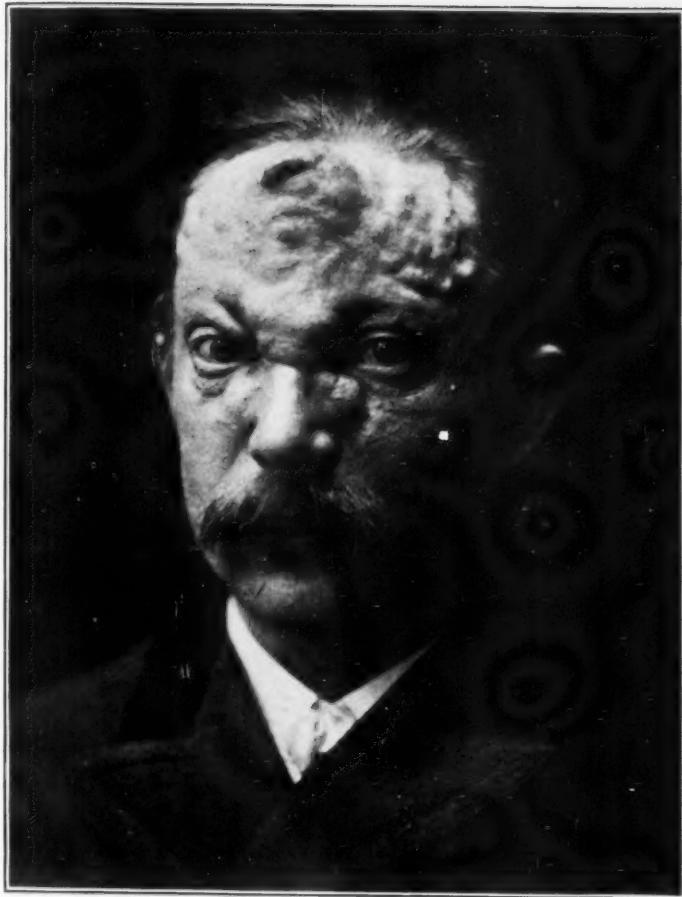was going on. But in spite of the great care taken by him, the

Fig. 1.—Angioma racemosum. Front view.

FIG. 2.—Angioma racemosum. Side view.

FIG. 3.—Lines of ligation and incision. (Four weeks after extirpation.)
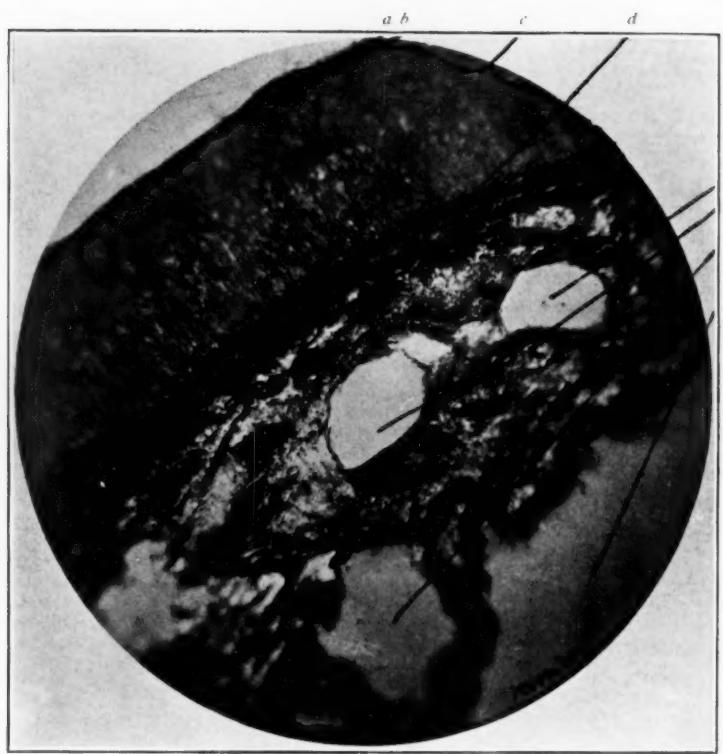
FIG. 4.—Aneurisma racemosum. *a* and *b*, intima and media; *c* adventitia; *d*, elastic layer; *e*, blood-spaces—empty.

hæmorrhage was profuse, so that the patient needed stimulation after the operation was completed. Recovery was uneventful.

The microscopical examination (Fig. 4) made by Dr. H. Kreuder, at St. Mark's Hospital, showed that the structure of the large vessels was predominantly that of veins. The intima and media were almost one layer, composed of an endothelial lining, outside of which was a sparse lot of smooth muscle-cells mixed with a small amount of elastic connective-tissue fibres, both of which were running in a circular direction.

The adventitia consisted of two layers, the inner one being thick and composed of smooth muscle-cells, running in a longitudinal direction, and held together by fibrous connective tissue, while the outer layer was made up of loose fibrous connective tissue. Between the two layers of the adventitia a small amount of elastic tissue was noticed, which might be looked upon as a separate layer.

The walls of these vessels were exceptionally thin in some areas, but did not show any signs of degeneration or inflammation. The tissue situated outside of the large vessels showed the structure of angiocavernoma, in which the walls of the blood-spaces were made up of a thin connective-tissue framework lined by a single layer of endothelial cells. In some places patches of round-cell infiltration could be seen between the blood-spaces which seem to be assuming a spindle form. Thus it would resemble cavernous angiosarcoma, but the clinical observation would point against the theory of malignancy.

THE TREATMENT OF ANEURISM OF THE EXTERNAL ILIAC ARTERY BY DIGITAL COMPRESSION.

WITH REPORT OF A CASE.

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THE methods of treating aneurism have been many and various. In the time of Celsus the tumor was cut into and, to arrest the frightful hæmorrhage which resulted, a heated iron was thrust into the wound. Rufus and Antyllus cut into the aneurism and cleared out the contents, but previously tied the vessel above and below the aneurismal dilatation. Morel in 1674 introduced the tourniquet, and this prevented the very severe hæmorrhage which always resulted from opening an aneurismal tumor, and enabled the operator to tie, at least temporarily, the vessel.

The surgical operations for the cure of aneurism were so dangerous, that in cases where the aneurism occurred in the extremity, amputation above the aneurismal tumor was often resorted to in preference to interfering with the aneurism itself. Anel in 1740 first showed that it was not necessary to open the tumor to cure the aneurism, and he cured a case of aneurism at the bend of the elbow by ligating the artery above the tumor and without opening the sac.

To John Hunter we are much indebted, for he first taught that it was not essential, in order to cure the aneurism, to arrest the flow of blood completely, but only, as he said, " to take off the force of the circulation;" and thus he showed that if the artery were tied some distance above, and where it was healthy, a cure would result.

Although pressure directly over the aneurism has been applied for the cure of aneurism from time immemorial, it was

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not until the establishment of the Hunterian operation that pressure was applied to the artery above the aneurismal sac. At first this was not a successful treatment, chiefly because it was applied too energetically and resulted in pain, inflammation, and sloughing of the compressed parts, and was practically abandoned as a mode of treatment. Later, however (about 1825), the treatment by compression was resorted to again, but in a more scientific way and with better instruments, such as those of Signoroni, Hoey, and later that of Carte and others. The pressure was neither severe nor constant, was maintained only so long as it could be conveniently borne by the patient, and as soon as there was swelling, numbness, throbbing, etc., the pressure was reduced or removed altogether. When the tissues had regained their normal condition the pressure was reapplied. In this way the circulation in the tumor was reduced and coagulation favored; the tumor usually diminished in size, became harder, and ultimately, in a favorable case, the pulsation would disappear altogether. It was not necessary that the pressure should always be at one point, and sometimes two instruments were used,—one was slackened and the other screwed tight so as to compress the vessel, and *vice versa*.

Digital compression was first employed as a sole method of treatment by Dr. Knight, of New Haven, Connecticut, in 1848, and was successful. Vanzetti, of Padua, reported cases successfully treated by this method in 1853–1855, and he claims priority in the method, for he treated a case of popliteal aneurism by digital compression in 1846. It is no doubt chiefly due to Vanzetti's advocacy of this form of compression that it was so generally adopted.

The advantage of digital compression is that no apparatus is necessary, the finger being the sole means by which the artery is controlled above the aneurism. It is necessary to have relays of assistants in order to effectually employ this treatment. It can be better undertaken where there is a medical school and where intelligent students can be made use of to carry out the treatment. The vessel is compressed by the

finger, and as soon as one person gets tired he is replaced by another, who compresses a little higher up or lower down. Few care to keep up the compression more than five or ten minutes at a time. Continuous compression can thus be kept up for many hours by having shifts of a dozen students alternating with one another. The part to be compressed should be carefully shaved and dusted with powder. After pressure has been applied for a time, the patient may feel much pain, and this should be controlled by a hypodermic injection of morphine. Twenty-four hours are usually sufficiently long to keep up the compression, and in the case reported below the pulsation ceased completely in the aneurism in twelve hours.

It is the fashion at present, as perhaps it has always been, to run after new methods of treatment and to forget that there is anything good in the old. Now digital compression in some cases is of great value, and, even if it fails, does not interfere with the employment of other measures later on. In the form of aneurism in which it was tried in the case reported below, it is especially of service, and if successful prevents the patient running the risk of a most serious operation. I refer to cases of inguinal aneurism involving the femoral and external iliac artery.

In this case the man, first of all, objected strongly to a cutting operation; secondly, the aneurism extended up so far that it was thought that if any ligature of a vessel was undertaken it would have to be the common iliac. The good results in this case fully justified the reasonableness of the treatment.

J. H., aged forty-three years, married, founder by trade, was admitted into the Montreal General Hospital, August 19, 1902, complaining of a swelling in the groin. The patient has lived in Montreal for the past ten years, before that he lived in England. He is a moderate-sized, well-built man; never has had any severe illness; never had venereal disease in any form; is a very moderate smoker, and uses alcohol very rarely.

History.—He strained himself lifting a heavy weight some months ago. About two months ago he noticed a swelling in the groin, which pulsated and was soft and painless. This swell-

ing gradually enlarged and became harder, and seemed to grow upward into the abdomen. Now there was difficulty in stooping, pain, and some swelling of the limb, but he worked up to the time of his admission. Of late he had not noticed much increase in the size of the tumor.

On admission, the following note of the condition of the tumor was made: In the right groin and extending upward in the course of the external iliac artery is a fusiform swelling which has all the characteristics of an aneurism, pulsates, and the pulsation is distensile. On pressing deeply in the iliac fossa above the tumor the pulsation in the tumor is arrested and the sac becomes flaccid. On removing pressure, pulsation is resumed. The tumor feels bilobed on palpation, the smaller part forming the lower lobe. This partition of the tumor is evidently due to Poupart's ligament stretching across it. It seems to extend some three inches above Poupart's ligament, and on deep pressure its upper limit can be made out and appears to overlap the artery.

The patient objecting to operation, it was thought better to try palliative means until the Session opened and relays of students could be obtained for digital compression; so he was put on Tufnell's treatment and ice-bags applied over the tumor. He was given iodide of potassium internally and very little fluid. In a couple of weeks there was a marked decrease in the size of the tumor, and the pulsation did not seem so strong. The tumor now appeared to be a little larger than a hen's egg. It remained stationary after this and did not decrease further. By the end of September, most of the students having returned, digital compression was commenced. The parts were shaved and washed with alcohol and dusted with talc powder. Students were divided into three groups of twelve, each group being on duty eight hours, each student compressing the artery for five minutes. At the end of twelve hours pulsation had entirely ceased, but compression was continued in a more moderate degree for twelve hours longer. After the first four or five hours the patient complained bitterly of pain, although there was no excoriation at points of compression. The pain was easily controlled by hypodermic injections of morphine. After twelve hours the patient had no more excessive pain, in fact was comfortable. His leg was now wrapped in cotton wool and carefully bandaged.

The patient was kept in bed a couple of weeks more, and all

this time the tumor was contracting and hardening. I saw him six months after his leaving the hospital, and, although the tumor could be easily felt, there was no pulsation and it was very hard.

I saw a similar case treated successfully in this way many years ago by the late Professor Fenwick, of McGill University, and this it was that induced me to make a trial of the treatment by digital compression.

CALCULOUS ANURIA: ITS DIAGNOSIS AND TREATMENT.

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ANURIA may result from calculous disease of the kidneys in two ways. It may be the result of the gradual disorganization and destruction of the kidneys in consequence of a pyelitis and pyelonephritis caused by the irritation of the stones. This form of anuria appears as the end result of the disease and is usually accompanied, indeed is often preceded, by recognizable symptoms of uræmia. It is often preceded also for a long period by a polyuria similar to that which is seen in interstitial nephritis.

In this form of anuria, the diminution in the amount of urine comes on rather gradually, and the suppression is rarely complete until the end of life.

The other form of anuria in these cases is brought about by the stoppage of the ureter by a stone. Under these circumstances, the anuria comes on suddenly and is often complete from the start. If the stoppage is complete, the suppression persists to the end of life, or till the stone is removed either naturally or by operation.

This latter form is that properly known as *Calculous Anuria*.

Calculous anuria is to be distinguished from other forms of anuria by the sudden onset and by the absence of uræmic symptoms. The length of time during which complete suppression may persist in these cases without evidence of uræmia varies in different patients from three to ten days according to Morris. Sometimes death supervenes without uræmic symptoms.

Occasionally, the stoppage is not persistent. The sup-

pression lasts for several days, and then is followed by the profuse escape of a watery urine. This course of things may repeat itself several times. It is to be explained by the presence of a calculus in the renal pelvis which causes an intermittent stoppage of the upper end of the ureter, or it may result from the impaction in the course of the ureter of an irregularly shaped stone which by a slight shift of position permits at times the escape of urine alongside of it.

This intermittent anuria is not infrequently associated with a condition of hydronephrosis.

Calculous anuria may be brought about by the simultaneous stoppage of both ureters by impacted calculi. As a rule, however, when both ureters are stopped by stones, one of them is a long-standing impaction, and the kidney on that side is practically destroyed. The anuria is then the result of the stoppage of the ureter on the functionally active side.

A similar condition is produced when one kidney is congenitally absent or destroyed by any form of antecedent disease, and then the remaining one is shut off by a stone.

Cases are reported in which, although the other kidney was comparatively healthy, a fatal suppression has followed the stoppage of one ureter. Authentic instances of this occurrence are, however, so rare that it may be stated, as a rule, that sufferers from calculous anuria are patients with but one kidney.

Legueu, analyzing thirty cases in which the condition was proved by autopsy, found that the other kidney was absent in three cases, was more or less destroyed by calculus in twenty cases, and had the ureter stopped in six. In but one case was the kidney in fairly good condition, and in that there was epithelial proliferation in the tubes.

Morris, by similar analysis of twenty-eight cases, found the other kidney absent in six; marked atrophy in eight, in two of which the ureter had become impervious; almost entirely disorganized by calculus in eleven; destroyed by a hydatid cyst in one; enlarged in two.

Calculous anuria is so distinctly a mechanical condition

that it requires surgical measures for its relief, except in those rare cases in which Nature works a cure by furthering the escape of the calculus along the ureter into the bladder.

Occasionally, also, it happens, as has been said, that a calculus blocking the upper end of the ureter falls back into the pelvis of the kidney, and so removes the obstruction.

Unfortunately, cases of recovery from this affection are rarely studied with sufficient accuracy to thoroughly explain their mechanism. Morris mentions [1] a case of James Russell, in which the anuria lasted twenty days, and terminated by the discharge of ten litres of urine in twenty-four hours. A year later the patient died, and at the post-mortem examination there was discovered a double hydronephrosis with calculi in the pelvis of each kidney.

He also reports a case of his own as follows: " In one of my cases, complete anuria, accompanied with pain and a tumor in the left renal region, occurred on many occasions, lasting two or three days at a time. The right kidney was packed with calculi, calculi being felt to grate on one another, and the left kidney, which had undergone compensatory hypertrophy, was in an early stage of hydronephrosis and contained a single round calculus, the size of a small cherry, which was freely movable in the renal cavity. The left ureter was unobstructed and normal throughout."

These cases would seem to belong to the second category of those in which the calculus blocked the upper end of the ureter for a time, and then fell back into the pelvis.

Morris does not report any cases of recovery from calculous anuria in which recovery was brought about by the spontaneous escape of the stone into the bladder.

I find that Demons [2] reported a case in which the anuria ceased on the expulsion of a calculus.

Féréol [3] also reports the case of a man of forty-nine who had anuria for eight days, and then suddenly began passing urine of low specific gravity to the amount of ten litres in twenty-four hours, and shortly expelled from the bladder a uric acid calculus of the size of a pea, with several small ones.

The reason that the spontaneous escape of the stone downward in these cases is so rare is because the anuria is so complete. The excretion behind the plugged ureter ceases, and there is no longer any pressure from behind to push the stone along.

Cases that the writer will presently report seem to show that these stones may sometimes require but little forward push to accomplish their escape into the bladder; and it is quite possible that in some cases of spontaneous recovery from calculous anuria an immediate washing of the bladder with a litholapaxy pump might have obtained calculous matter, and thus have shown that the stone escaped in this direction. No case has been found, however, in which this demonstration has been made.

The possibility of an occasional spontaneous recovery raises the question as to whether we are ever justified in treating these cases on the expectant plan.

I feel that such a termination of calculous anuria is so rare that it is better judgment to interfere surgically as soon as it is plain that a cessation of renal function has become established.

Legueu studied fifty-six cases of anuria that were not operated; of these sixteen recovered, the excretion of urine being re-established on the third day in one case; between the fifth and tenth days in ten; on the thirteenth, fourteenth, and fifteenth days, one each, and in two cases at a still later day.

Morris similarly collected forty-eight cases not operated upon. Of these, thirty-eight died and ten recovered.

We have then a mortality of from 72 to 80 per cent. following the expectant plan of treatment.

The reported cases of surgical intervention are as yet few, but already it is clear that the results are far better than a 75 to 80 per cent. mortality.

With the object of making surgical interference effective, such a case should be carefully studied to determine the probable condition of the two kidneys. It is to be borne in mind

that usually one kidney is already functionally inactive. Such being the usual condition, it is obviously of first importance to determine which kidney has just been stopped by the calculus, and can probably be restored to usefulness by operation. The history and examination of the patient will usually clear up this point. If the pain at the onset of the attack was distinctly localized in one side, especially if that kidney is enlarged and tender, it is reasonably clear that it is on that side that the calculus is lodged. Not infrequently, however, the suppression is so complete from the start that tension in the affected kidney is but slight and of short duration. As a consequence, the pain is moderate in degree and quickly subsides.

In one of the writer's cases (Case I) there was no pain on the sixth day, when the patient was seen. At the onset of the attack the pain had been sharp in the left kidney, but quickly became diffused over the whole back. This patient had had previous attacks of renal colic in which the pain was thought due to rheumatism until the passage of a stone revealed its true nature. In the other case the pain was distinctly referable to the right kidney, which was enlarged and tender.

In the absence of pain and tenderness over the kidney, the course of the ureter should be explored by palpation over the abdomen and loin. The writer in one case [4] of ureteral calculus (not anuric, although the urine was much diminished) found an exquisitely sensitive point in the loin just above the crest of the ilium, and cutting down on this found and removed a calculus as large as a small bean.

Rectal and vaginal touch should also be used to explore the lower end of the ureters. In another [5] of the writer's cases (not anuric) a large stone was felt in the lower end of the ureter by vaginal touch, and removed by incision through the vault of the vagina.

The X-ray may be of distinct service in locating the calculus. Enough ureteral stones have been accurately determined in this way to show the value of this method of investigation. In a case of Dr. J. W. Elliot's [6] seen by the writer, the skiagraph gave a clear picture of a small stone lodged in

the ureter, just above the crest of the ilium. It was removed by Dr. Elliot from this place, and the finding of the X-ray was confirmed in every respect.

Cystoscopy, too, should not be neglected. Morris says, " The ureteral cystoscope in cases of anuria is quite unnecessary, and in my opinion out of place, as it can give no information which is not more fully ascertained by rectal and vaginal examination, and by a sound in the bladder." With this opinion the writer cannot agree.

Certainly, when all necessary information can be obtained in other and easier ways, it would be unwise to waste time over cystoscopy.

But in a difficult case, when the evidence is insufficient to tell even in which ureter the stone is lodged, the cystoscope in skilled hands may bring the needed information.

Catheterization of the ureters in the hands of an expert may lead to the correct understanding of a doubtful situation that has baffled other methods of investigation. In short, no means should be left untried in dealing with these perplexing conditions.

Before proceeding to the consideration of the operative treatment of calculous anuria, the following cases are reported to show the difficulties to be encountered. The first case has already been reported [7] and is briefly recapitulated here.

CASE I.—E. A. P., a strong man of sixty years, seen in consultation with Dr. G. K. Sabine, of Brookline, Massachusetts, on December 12, 1892.

Always subject to rheumatism. Seven years ago an attack of renal colic in the left kidney and passed two stones. Then well until two years ago, when he had an attack of pain in the right side and passed a stone that was larger than the previous ones. The pain in this attack was thought to be due to rheumatism, and was not so severe as is usual in renal colic, so that its origin was not suspected until the stone was passed.

Then free from trouble until November, 1892. Early in that month he had some twinges of pain in the right side, which were thought to be due to rheumatism. They passed off. Then

a similar pain came in the left side on the 19th of November.
The pain in this attack was not severe, but was recognized as
similar to that which he had had two years before, when he
passed a stone. December 5th was seized with an acute pain in
the back. This was so severe as to throw him into a profuse
perspiration; the pain was felt through the abdomen as well as
in the back, and was distinctly referred to the left side.

December 6th it was noticed that he was not passing any
urine. Anuria continued through the 7th, 8th, and 9th. On the
latter day a catheter was passed, but only a drachm of turbid
urine was obtained. From that time there was no water up to
the time that I saw him on the evening of December 12.

He looked quiet and easy, not at all sick; he had no nausea,
no headache, no drowsiness,—in fact, he said he felt perfectly
well. Examination could detect nothing either in the abdominal
or lumbar region. There was no tenderness anywhere, even to
forcible pressure. Advised to take considerable water, to have
a mustard poultice over the kidneys, and sugar of milk freely
through the night.

The following day he had passed no urine, he was a little
more dull, his tongue was very dry, he had no pain, his pulse
was 76 and of fair strength. Some relish for food, and no nausea.
There was a little more resistance in the right renal region than
in the left. The rectal examination showed a prostate of mod-
erate size, but nothing above the prostate, either of tenderness or
hardness, in the region of the ureters. An operation was advised.

It was designed to open the abdomen by a median incision,
to examine both kidneys and their ureters, and then to proceed,
in the best way possible, to the correction of whatever condition
was found. The operation was performed on the morning of
December 14, between seven and eight days after the establish-
ment of complete anuria.

On the morning of the operation he had begun to show
evidence of constitutional disturbance. The pulse and tempera-
ture had risen decidedly, and there was some commencing mental
hebetude.

Operation was done under ether. Median incision between
umbilicus and pubes. Right kidney was felt to be enlarged to
perhaps three times the normal size; its surface was irregular
and divided into large lobes. Palpation of the ureter was diffi-

cult, on account of the abundance of fat in the post-peritoneal tissues, but no hardness suggesting a stone could be felt any-where in that pelvis or ureter. Left kidney was of normal size, and its pelvis was not distended with fluid. The ureter on this side was followed down with great care from the kidney to the bladder, but nothing like a stone could be detected. The bladder was contracted in the pelvis. The condition of things thus con-firmed the previous opinion that the right kidney was previously disabled, and that the stone which caused the final suppression was blocking the left kidney.

With the object of more carefully palpating this organ, which was deeply buried in fat, I made an oblique incision in the left loin and uncovered that kidney. With one hand in the abdomen and the other in the wound in the loin, very careful search of the pelvis of the kidney and of the upper part of the ureter was possible, but the result was negative.

The opinion was expressed to the friends that possibly our thorough manipulation would be found to have dislodged the obstructing body.

The patient recovered well from the ether, and about three hours later, when I saw him, there was a slight escape of urine through the urethra, and on passing the catheter, thirty-seven ounces of light-colored urine were drawn. Two gallons of urine were obtained in the first twenty-four hours. In the second twenty-four hours the amount fell to about five quarts, and after that there was a steady, gradual diminution, until the daily amount had reached the neighborhood of seventy ounces, at which it held.

Convalescence was satisfactory, and about a fortnight after the operation I washed out the bladder with a litholapaxy pump, obtaining a few grains of calcareous matter, thus completing the evidence that the ureter had been stopped by a calculus, which had been displaced by my manipulations.

Not long after the patient had gone from the hospital, he had another attack of discomfort in the left side of the abdomen, accompanied by a chill and high temperature. I saw him after this had persisted for a good many hours, and found him passing an abundant quantity of water, but still suffering from discom-fort through the lower part of the abdomen on the left. Careful examination detected nothing abnormal in that region.

Remembering the experience of the previous attack, I made

considerable massage through the abdominal wall, down along the course of the ureter, and as deeply into the pelvis as I could reach. From the time of my examination he was comparatively comfortable. A week or two later a stone was passed that was decidedly larger than the calculous bits that were obtained by pumping after the operation. I have not seen the patient since, but have heard that he had still another attack of pain, with again the passage of a stone, since which time he has remained well.

CASE II.—J. H. P., a strong, vigorous man of fifty-seven years, entered the Massachusetts General Hospital on March 3, 1903, with the following history. Gonorrhœa thirty years ago. Typhoid fever fifteen years ago. For the last fifteen years he has been subject to attacks of severe pain, starting in the right lumbar region and shooting down into the right groin and into the penis. These attacks have occurred about once a year, and have been accompanied by nausea, vomiting, and by bloody urine. They have been usually followed by the passage of stones from the bladder. These calculi have been sometimes one-half of an inch in diameter. Two years ago he had an unusually severe attack; but this time the pain was on the left side. This attack was accompanied by fever and made him much sicker than ever before. This laid him up for several weeks. A few months later he had another very severe attack on the left side. During the past year he has had these attacks in the right side about once a week. For the last three weeks he has had persistent, almost constant, pain in the right side with nausea and vomiting each day, but has passed no stones. The urine has been greatly reduced in amount and has not exceeded, he thinks, two or three ounces in the twenty-four hours. He has severe burning pain in the glans penis.

Physical examination showed a mitral, systolic murmur with some increase of cardiac dulness. The abdomen was soft and tympanitic everywhere except in the right lumbar region, where there was great tenderness and muscular rigidity. There was a deep sense of resistance over the right kidney. The prostate was little, if at all, enlarged. The catheter drew one ounce of clear urine, no stone was touched. A skiagraph of renal and vesical regions was negative.

I saw the patient twenty-four hours after entrance, during which time he had passed no urine beyond that drawn by the

catheter. It seemed probable that the right kidney was stopped
by a calculus, and that the left kidney was practically useless.
The two severe attacks in the left kidney were believed to account
for its inactivity. I therefore cut down upon the right kidney,
following the line of Israel's incision. The fat capsule was tense
and œdematous; the fat being stiff, almost as if frozen, and
closely adherent to the kidney beneath.

The kidney was enlarged to nearly double the usual size.
On account of its size, it was rather difficult to lift it out of the
wound. It was dark purple in color and was dotted with little
prominent yellow points, strongly suggesting miliary tubercles.
One of these was cut out and at once examined by Dr. J. H.
Wright. It was found to be a little abscess containing a few
indeterminate crystals.

An incision along the convexity opened the pelvis, which
was explored with the finger, but no stone was found. The
ureter was followed down towards the bladder, but nothing could
be felt in it. It was carefully stripped from above downward
in order to dislodge any stone that might have escaped observa-
tion. A drainage tube was then introduced into the renal pelvis,
the capsule was split along the convexity, and the wound was
closed as far as drainage would allow. Within the next six hours,
the patient passed voluntarily 900 cubic centimetres of urine. In
the next twenty-four hours he passed 1500 cubic centimetres, and
as much more was estimated to have escaped through the tube
into the dressings.

On the fourth day the urine suddenly ceased coming through
the bladder, and a proportionately increased amount escaped
through the tube into the dressings. After this condition had
persisted for forty-eight hours, the patient by a forced attempt
at urination squeezed out a few drachms of greenish pus. Some
hours later urination by the bladder was resumed and the drain-
age through the tube again diminished. On the eighth day the
pain had wholly ceased, and the patient expressed himself as
" feeling better than for ten years." The tube was removed and
the leakage through the wound quickly stopped.

On the twelfth day he had two short attacks of pain in the
left lumbar region, similar to those he had had formerly, but of
slight intensity. On the fourteenth day the bladder was washed

with the Bigelow Evacuator. Two stones about the size of a grain of wheat were obtained, and a larger stone was heard to click against the tube. This stone, measuring one centimetre in diameter, was crushed and pumped out under cocaine anæsthesia on the twenty-fourth day.

From this time recovery was uneventful, except that on one day when he got up the urine ceased to flow. After being up for six hours, he returned to bed, and the urine at once began to pass in large quantities. After convalescence was fully established, the bladder was examined with the cystoscope. The right ureter was about three times the normal size and the urine could be seen to come from it in jets. The left ureter was occupied, and fully filled by a string of thick pus which was not moved or stirred by any urine escaping alongside of it. On the following day, the cystoscopic examination was repeated, and again the left ureteric orifice was seen to be occupied by a plug of pus. While, now, this orifice was clearly kept in view, an assistant made pressure over the left kidney. At once a gush of thick pus was seen to come from the ureter. Dr. W. W. Gannett, who was present, saw this phenomenon repeated a moment later. Again no urine was seen to issue from the left ureter.

These two observations, together with the fact that when on the fourth day after operation the right kidney ceased to send its urine to the bladder, that viscus remained empty for two days, seemed to prove beyond question that the left kidney was practically destroyed. As it was wholly insensitive, and gave him no trouble, the patient did not care to consider its removal.

These cases are especially interesting taken together, because in both of them it was impossible to locate the stone, and it was subsequently shown that the stones were very small.

Judging from the immediate relief that followed the thorough palpation of the ureter, it seems probable that these small stones were arrested just where the ureter enters the bladder. A case reported by M. Duffan-Lagarosse [8] shows how a very small stone at this point may lead to partial anuria.

The first case occurred before cystoscopy was commonly practised, and in the second case the indications for operation

on the right side were so clear that it was not thought wise to waste time examining the interior of the bladder. It seems probable to the writer, however, that in either of these cases an inspection of the ureteric orifice might have shown a bulging, or even the commencing protrusion of the calculus. If inspection was negative, a catheterization of the ureters might have been relied upon to furnish important evidence; and in a doubtful case this should certainly be tried.

In Vol. xii of the *Annales des Maladies des Organes Génito-Urinaires*, Kaefer reports a case of death from anuria in which the autopsy showed that both ureteric orifices were occupied by stones that projected slightly into the bladder cavity.

These cases are chiefly interesting, finally, because they were both relieved by a method that I have not found described in treatises upon calculous anuria, and which was so efficacious that it ought not to be lost sight of by operators on these cases.

In Case I it would perhaps have been wiser to have done a nephrotomy, and thus afforded drainage behind the point of obstruction. The kidney being of normal size, with no distention of the pelvis, the propriety of opening did not suggest itself.

Operative treatment in calculous anuria aims first at the removal of the stone.

If the case is seen early, that is, within two or three days of the onset, it will be well for the surgeon to remember that a stone may be assisted along the ureter by manipulations.

Both of the cases just reported show what can be accomplished in this way.

Case I is especially interesting, because in the attack subsequent to the operation the calculus was dislodged and forced on to the bladder by massage applied through the abdominal wall. During examination of the patient, then, vigorous massage down along the course of the ureters should be made, and it may occasionally happen that a cure will be brought about in that way.

This possibility should never lead to delay of operation, but during the first days of the anuria, while the case is being studied, efforts to thus dislodge the stone may well be made.

If the locality of the stone is made out, it may be dealt with according to the following plan.

If the stone is in the pelvis of the kidney, it may be reached and removed by a nephrotomy, which also affords opportunity for drainage.

A stone between the kidney and a point two or three inches above the bladder may be reached and dealt with through the incision described by Israel, running from the twelfth rib downward and forward just in front of the anterior superior spine of the ilium. Through this incision, in a thin subject, the greater part of the ureter may be reached without injury to the peritoneum. In a stout person, however, there is difficulty in dealing with the last few inches above the bladder. In the female, this part of the ureter is accessible through the vagina.

Emmet removed a stone from the bladder end of the ureter through a vaginal incision, but felt that only stones in the extreme end of the ureter could be safely reached from this direction on account of the danger of wounding the peritoneum. The writer later [9] showed by dissections that in women the last two and often three inches of the ureter lie below the peritoneum, and in such relation to the vagina that it may be opened into from the vaginal side without fear of injury to the abdominal cavity. In connection with the account of this investigation, he published the report of a case in which a stone weighing 190 grains was safely removed from this part of the ureter.

The writer has also had one case (not anuric) where the stone, which was very irregular and branched in shape, was sticking in the part of the ureter that lies in the bladder-wall. It projected somewhat into the bladder, and was dislodged by manipulation of the finger introduced through the dilated urethra.

This lowermost part of the ureter in the male is more difficult of access. The writer in the article above alluded to pointed out the fact that this portion of the canal could be reached extraperitoneally by a Kraske incision with removal or displacement of part of the sacrum. Morris operated in this way in 1900.

We now come to consider the proper procedure in cases where the location of the stone cannot be made out.

If we can determine with reasonable assurance on which side the useful kidney is, it is plainly best to cut down on it, open and explore the pelvis, and if the stone is not there to follow down the ureter. If still no stone can be found, the ureter should be thoroughly stripped from above down to endeavor to dislodge the stones which, from the very fact that they cannot be felt, may be presumed to be small.

In this connection, it is well to call attention to the fact that it is not necessarily the enlarged kidney which should be approached by operation.

In the writer's first case, the right kidney was found to be enlarged, but it was plainly the one which had long been inactive. In the second case, however, it was the enlarged kidney that was functionally active, and was therefore properly subjected to operation.

Lastly, in certain cases, the symptoms and physical signs will fail to give us reliable information, and we shall approach the operation without any certainty as to which side should be attacked. In these cases an exploratory laparotomy, by enabling us to accurately examine both kidneys and to follow the ureters through their whole course, may supply the information needed for our guidance. Any slightly added risk from opening the abdomen will be more than counterbalanced by the added light that such an exploration is likely to throw on the case.

In some cases, the aid of the hand within the abdomen may enable us to remove a stone deep in the pelvis through an extraperitoneal incision.

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[6] Boston Medical and Surgical Journal, May 16, 1901.

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[9] American Journal of the Medical Sciences, January, 1892.

A NEW METHOD OF PERFORMING PERINEAL SECTION WITHOUT A GUIDE.

BY CHARLES LANGDON GIBSON, M.D.,

OF NEW YORK,

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THE modification of operative technique to be described is intended to give an immediate and certain entrance to the deep urethra in strictures impermeable to any guide.

To surgeons of experience, external urethrotomy without a guide—in simple cases free from the presence or sequelæ of urinary extravasation—does not ordinarily offer any special difficulty. A limited number, however, do present obstacles which may render any extraordinary resource of value. To the casual operator, this operation will generally represent a serious procedure, often attended with a laborious and protracted search for the elusive urethra.

When an operation for impassable stricture is complicated by the effects of urinary extravasation, it frequently is difficult even for the most skilled, and considerable time may be necessary to bring the operation to a successful termination. An assured and time-saving technique is therefore particularly desirable in these very grave conditions, when a prolonged anæsthesia may, and often does, become the prominent factor of a fatal result.

I found by repeated trial on the cadaver that by exercising sharp traction on the prostate the deep urethra is made taut to a degree that renders its recognition unmistakable, and gives one an immediate and absolute control of the situation.

The traction on the prostate is exerted downward and somewhat backward. To make its results plainly manifest, the

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FIG. 1.
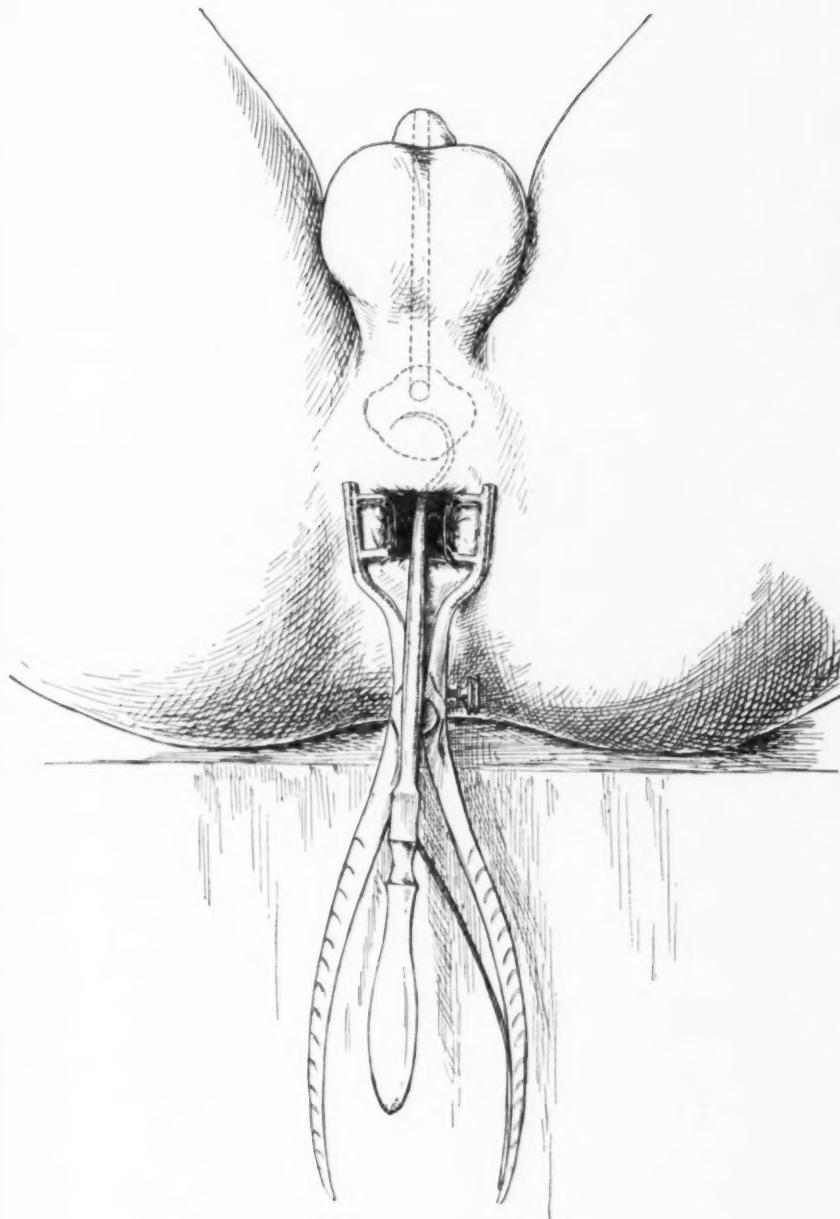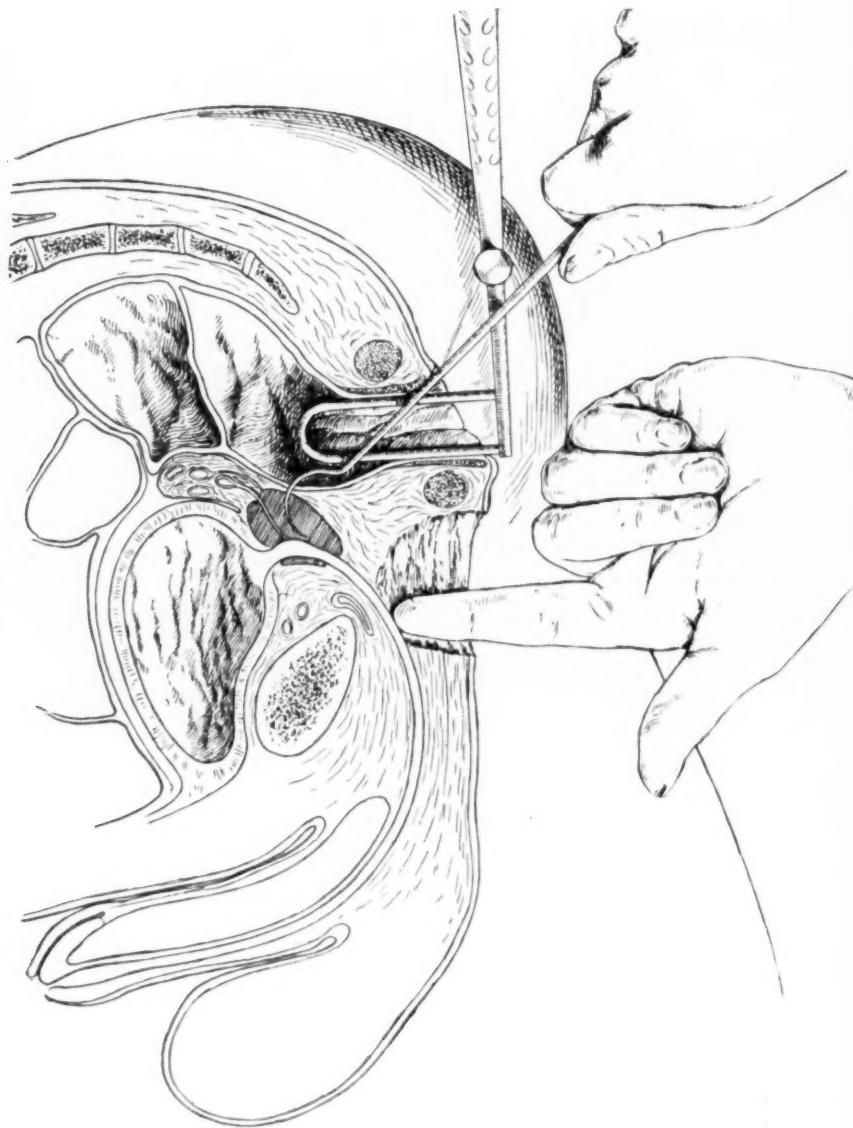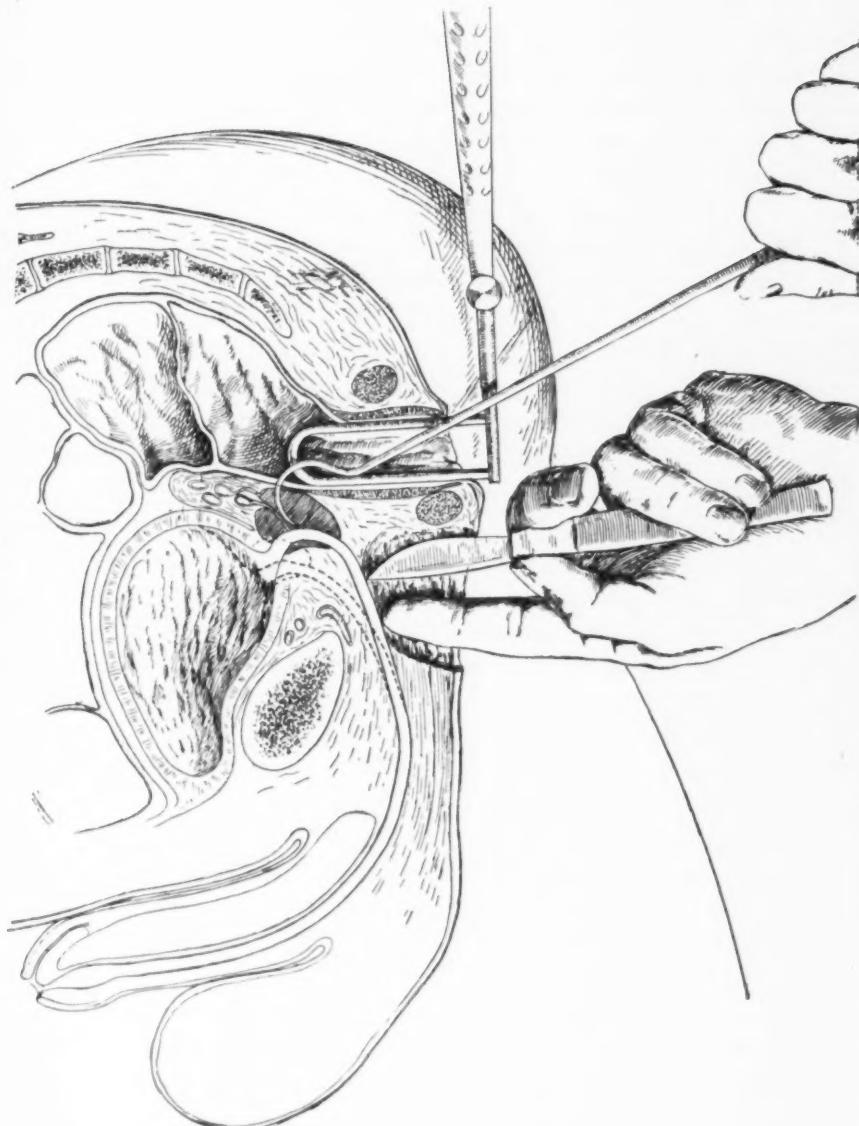

The hook transfixes the prostate.

FIG. 2.

Finger inserted into perineal wound, ready to feel the tension on the urethra.

Fig. 3.

The traction on the prostate displaces with it the urethra, and its resulting tension is felt by the finger.

traction must be effectually performed by firmly seizing the
prostate with suitable instruments.

The technique is as follows: Lithotomy position. Thor-
ough preliminary irrigation and cleansing of the rectum. A
suitable speculum, preferably Kelly's, is introduced, and the
prostate is *transfixed* laterally from the rectum (Fig. 1), pref-
erably by a large, sharp hook, which is driven firmly through
the prostate tissue.

The speculum is now withdrawn, leaving the hook *in situ*.
Median perineal section is then performed, the incision being
extended down to the ordinary depth of the situation of the
urethra.

The left forefinger is now introduced into the wound
(Fig. 2). As the assistant executes a series of gentle tugs
on the hook, one readily receives the sensation of the inter-
mittent tension of the urethra in response to the traction on the
prostate (Fig. 3). Keeping the forefinger in place, the sur-
geon (with the other hand, *not* as erroneously depicted in Fig.
3) directs his bistoury into that portion of the deep urethra
which is thus rendered prominent; the probe-pointed director
readily glides alongside the knife into the lumen of the urethra,
and following it the small metal catheter will demonstrate the
successful access to the bladder. The performance of these
various steps requires only a minute or two.

Within the past two years I have performed this opera-
tion more than twenty times in both the simple and compli-
cated cases with an uniform success. In my earlier cases I
attempted to use only slender volsella or tenacula; but later
experiences showed it was necessary to use the stout hook,
which I now always employ to get absolutely satisfactory trac-
tion of the prostate.

It will naturally occur to every one that there is a real and
serious danger of infection of the prostate by penetrating it
through the rectal wall. Practically, I believe the danger to
be more presumable than real. In none of my cases have any
bad results followed. I desire, however, to have it thor-
oughly understood that, with this possible drawback in mind,

I do not recommend the routine or indiscriminate employment of this measure. In the ordinary stricture operations, the saving of time in anæsthesia obtained by this direct method is not perhaps of sufficient importance to warrant its use in the face of a possible infection. Recourse to this method should therefore be reserved for the cases attended with unusual difficulties. In feeble patients, especially those suffering from diseased kidneys or other complications, and particularly in the septic states due to urinary extravasation, the very slight risk of an infection (which, if it occurs, can easily be attacked through the existing perineal incision) may wisely be taken in order to increase the chances of saving the patient's life.

A CLINICAL CONTRIBUTION TO THE KNOWL-EDGE OF TUBERCULAR DISEASES OF THE FEMALE URINARY TRACT.[1]

WITH A REPORT OF SEVEN COMPLETE NEPHRO-URETERECTOMIES.

BY EDWARD J. ILL, M.D.,

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THE origin of tubercular inflammation of the urinary tract is most frequently in the pelvis of the kidney or in the kidney itself. Thus far I have seen but one case (Case XI) where the beginning of the disease may have started in the bladder. The following case of the disease of the pelvis of the kidney could here be cited.

CASE I.—*Tubercular Inflammation of the Pelvis of the Right Kidney; Hæmaturia; Nephrectomy; Cure.*

Mrs. A. M., married ten years, aged forty-four years, has been in poor health since she ceased menstruating three years ago. She entered St. Michael's Hospital on January 22, 1903. Since November 24, 1902, has been passing bloody urine constantly, has had much backache and nausea, and a constant pain in the right loin, worse when sitting down. A catheterization of the ureters showed that the blood came from the right kidney. No tubercle bacilli were found, though repeatedly looked for by the bacteriologist. An exploratory operation was done January 29, and the kidney drawn out of the wound. It was rather a small organ. The pelvis of the kidney felt as though it contained a foreign body, and was opened by a longitudinal incision. A very firm blood-clot was all that was found.

The fear of continued hæmorrhage prompted the removal of the kidney, which, with two inches of the ureter, was sent to the pathologist of the hospital, Dr. Teeter. He reported tubercular ulcerations in the pelvis of the kidney eroding some of the blood-vessels.

[1] Read before the New Jersey State Medical Society, June 24, 1903.

The patient thus far has since remained well and is much improved in health.

Not only does the resistance of the bladder to the tubercle bacillus seem great, but the bladder will readily throw off the disease as soon as the original focus has been removed, as is shown in the following cases.

CASE II.—*Tubercular Left Kidney and Ureter; Extensive Tubercular Ulceration of the Base of the Bladder; Nephro-ureterectomy; Recovery; Normal Bladder at this Date.*

Miss P., a seamstress, aged twenty-seven years, was sent April 27, 1899, by Dr. E. De L. Bradin, because for more than a year she had suffered from more or less pain in the left lumbar region, not severe enough to incapacitate her until a month ago. About February 1, 1899, she also began to have frequent and painful urination; lost strength and flesh. She passed urine every twenty or thirty minutes and was up and down day and night. Dr. Bradin soon discovered that she had pus in her urine as well as tubercle bacilli and connective-tissue particles. The number of the bacilli in the urine was very large.

An examination disclosed a very thick left ureter and several tubercular ulcerations at the base of the bladder and at the opening of the left ureter. There was slight rise of temperature but no hectic.

May 24, 1899, the left kidney and ureter were removed. It was found that she had a cheesy abscess of the kidney as large as a walnut, and the ureter was so much thickened that the lumen was nearly obliterated. She rapidly got well. For about three months tubercle bacilli were occasionally found in the urine, and since then she has remained well, having been married a year after the operation. At present her urine is normal, as is also her bladder.

CASE III.—*Tubercular Right Kidney and Ureter; Tubercular Ulceration at the Meatus of the Right Ureter and its Surroundings; Nephro-ureterectomy; Recovery; Urine Normal at this Date.*

Mrs. S. S., Russian, aged twenty-four years, married, has two children and is in good general health, presented herself June 26, 1901, through the kindness of Dr. Parsonette, complaining of

painful urination. There had been pains in the right iliac region for some months.

Dr. R. N. Connelly found her urine to contain pus, tubercle bacilli, and shreds of cellular tissue. To Dr. Connelly I am much indebted for many favors in these cases. Upon catheterization of the ureters, it is found that the left kidney is healthy and the right kidney is diseased. The endoscope shows the bladder to contain a few tubercular ulcerations about the right ureter.

FIG. 1.
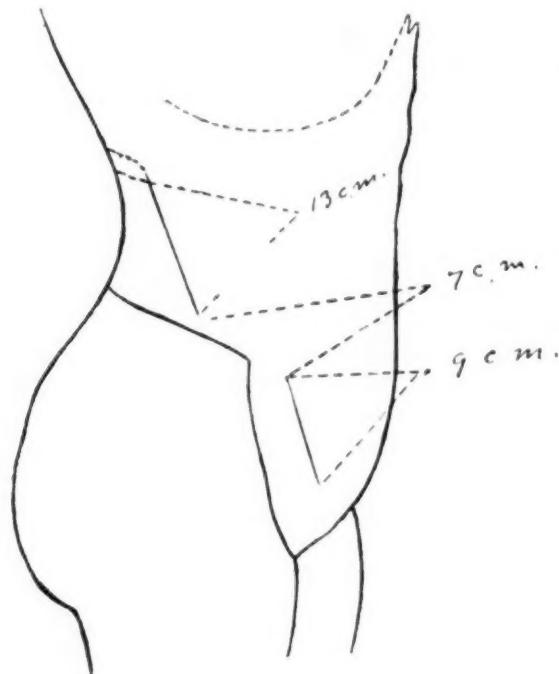
Case III, showing location of incisions for removal of ureter.

Typical nephro-ureterectomy performed June 28, as in the foregoing case. The incisions were thirteen centimetres long in the loin and nine centimetres long in the right iliac region, leaving a bridge between of seven centimetres. She made an afebrile convalescence, and was discharged cured in twenty-six days. She became pregnant within six months, and was delivered by

Dr. Parsonette in a normal labor.   At no time did the urine show anything abnormal during the pregnancy nor since.

CASE IV.—*Extensive Tubercular Ulceration of the Right Kidney and Ureter;   Extensive Ulceration of the Bladder;   Nephro-ureterectomy;   Recovery;   Urine perfectly Normal December 4, 1902.*

Miss E. B., aged twenty-two years;   single;   stenographer, and of good family history.   She presented herself in fair general health April 6, 1901, complaining of frequent and painful urination since three months and constant pain in the right lumbar region.   On questioning, it is discovered that she never eats meat nor drinks milk, living on eggs, vegetables, and cereals.   The pain was so great that she was unable to follow her employment.   Her urine was found to contain thick, heavy, tubercle bacilli and shreds of cellular tissue and pus.

The right kidney could not be made out, but the right ureter was much thickened, and many tubercular ulcerations were present in the posterior lower half of the bladder.   Catheterization of the ureters showed the disease to be confined to the right side.   The left kidney seemed normal.

Operation, April 9, 1901.—Lumbar incision over the right kidney, that is, from the end of the last rib downward and forward for about nine centimetres.   The muscles were not cut, but all fibres were separated.

The kidney was a large one and brought out with some difficulty.   The vessels were ligated with a Grad ligature, and the ureter gradually enucleated as far as the finger could reach.

An incision of six centimetres was then made at the edge of the rectus in the right iliac fossa, parallel with Poupart's ligament and down to the peritoneum.   The separation of the ureter was continued through the opening until its insertion into the bladder was reached.   It was then cut between two ligatures with the cautery, and the lower stump brought out through the vagina, where it was cut off with the cautery close to the bladder after ligating with catgut.

The very large kidney was found to be filled with miliary and large tubercles and several small abscesses.   The ureter was very much thickened, so as to appear about like a steel sound, No. 36 French.

Both wounds were drained with gauze.   On the next day

the patient's temperature rose to 104° F. and the pulse to 140 per minute. The wounds were opened all over, but no discharge showed itself. She was given twenty cubic centimetres of anti-streptococcus serum without any result, and went along for some months with a bad septic condition, of which she eventually recovered, and is perfectly well at this date. Her urine and bladder were last examined December 4, 1902, and found to be perfectly normal in every respect. At that time she appeared to be the picture of health.

From the history of these cases it becomes apparent that the diseased portion of the bladder may regain its health, and resection of the secondarily diseased portion is not a necessity. Even the ureter will apparently recover, as is shown by the following case.

CASE V.—*Extensive Tubercular Destruction of the Right Kidney and Ureter; Tubercular Ulceration of the Bladder; Nephrectomy; Recovery.*

Miss R. W., aged thirty-five years, single, seamstress, of good family history, was sent through the kindness of Dr. Gage March 1, 1901. This woman had been suffering for a year from great pain in the right lumbar region, running down through the right iliac region into the bladder. There was frequent and painful urination. On examination the urine was found loaded with pus and tubercle bacilli and tissue particles. The urine was ammoniacal and gelatinous. Her general condition was very miserable. She had night sweats and hectic, and was much emaciated. Her temperature reached 102° F. and pulse as much as 120 per minute.

The bladder was full of tubercular ulcerations and a thickened right ureter could be felt. The right kidney was much enlarged and sensitive, reaching as low down as the crest of the ilium.

March 5, 1901, a nephrectomy was performed. There was about a pint of foul pus in the kidney, and great difficulty was experienced in separating the adhesions. As the patient was in bad shape and the operation had to be hastened, the ureter was cut off with the cautery about two inches below the kidney. She quickly improved to the extent that she was discharged in thirty-four days.

For over a year, however, she was said to have remained very miserable with the tubercular disease of her bladder. Within a few weeks I have heard from Dr. Gage that she is now in excellent health, and seemed to have recovered entirely.

I do not wish it understood, however, that I would advise to leave an infected ureter in the patient. I would simply cite this case as a proof how much Nature will do to throw off the disease when the original focus has been removed.

It is for this reason, also, that the writer doubts the assertion that bladder tuberculosis occurs with any frequency through the blood current, but rather by contiguity. Why otherwise should these patients get well?

The early and most frequent subjective symptoms are pain referred to the loin and iliac region of the diseased side, and later to the bladder. In Case I the patient referred the pains to the loin very early, while Cases I, III, and IV also showed the later pain in the bladder. Now and then they complain of pain along the course of the ureter, and this is so severe that I have known the appendix to have been removed by a prominent surgeon by misapprehension.

This symptom would also show that the infection of the bladder was a later stage of the disease.

The pain at urination always means an infection of the bladder. The infection is most frequent at the trigonum and at the meatus of the ureters. In the old cases, difficulty to retain urine, after the desire to pass it once comes on, means an infection of the neck of the bladder.

Hæmaturia should be always looked at with suspicion. While blood that comes from the kidney most commonly means malignancy or stone in the kidney, the fact that it may be tubercular should not be lost sight of. The following cases will illustrate the point in question. There being but three cases of all reported in this paper that showed this symptom besides Case I, already cited, I wish to draw attention to

CASE VI.—*Tubercular Bladder, Right Kidney, and Cervix Uteri; Hæmaturia; Temporary Recovery.*

Miss L. S., aged seventy-six years, single, complained in February, 1902, of severe pain at urinating, after having had pain in the right iliac region for some time. I had seen her on and off for twenty years for a movable right kidney. Her urine was examined frequently during this time, and on several occasions there was some albumen, never any casts, but always a low specific gravity.

An examination of the urine in February, 1902, showed pus and tubercle bacilli in large numbers. In June and July, 1902, she lost some blood from the vagina which came from a tubercular ulcer at the cervix. In July there was a sharp attack of hæmaturia. While in the country she improved rapidly, so that in November, 1902, she no longer had any discharge of blood from the vagina and no painful urination, though small quantities of pus were still found in the urine.

A relapse of the bladder symptom occurred in April of this year and lasted for a month. During this time tubercle bacilli were again discovered, but at the present writing she is again in good shape and has no trouble with her bladder.

The following very interesting case is one of hæmaturia.

CASE VII.—*Tubercular Right Kidney and Ureter; Exsanguinating Hæmaturia coming from the Right Kidney; Right Lumbar Pain; Nephro-ureterectomy; Cured.*

E. C., married, aged thirty-nine years, mother of six children, in poor health, was sent to St. Michael's Hospital November 7, 1898, for chronic cystitis by Dr. Hagerty. Since two years she has been unable to retain her urine for any length of time. There was much blood and pus in the urine. The endoscope showed the bladder to be uniformly red, almost like granulation tissue, but no ulcerations.

A vaginal cystotomy was done November 12, 1898, and the bladder drained. There was no blood for a year. November 1, 1899, she was again admitted, to close the fistula and to do a nephrorrhaphy and appendectomy, having constant pain in the appendix and symptoms referring to the very movable right kidney. The fistula was closed by a flap operation. The appendix was removed through a lumbar incision and the kidney fixed. She was discharged well in four weeks, and remained well. Eighteen months later she gave birth to a healthy child.

During the next three years she was very well until May, 1902, when she had much pain in the right lumbar region, and of late there was a large amount of blood in her urine. The pain in the right kidney was most unbearable; she would have chills and fever for three and four days at a time. Her physician, Dr. Hagerty, again sent her to St. Michael's Hospital November 28, 1902. A search for tubercle bacilli was made in vain by Dr. Connelly. She gladly accepted the operation of removal of the right kidney, as no blood came from the left kidney by ureteral catheterization. A calculus was expected. On lifting the kidney out of the loin through the lumbar incision no stone was detected, but an immense thickened ureter, which was certainly thought to be tubercular. The kidney with the ureter down to the bladder was removed. At the present writing, May 17, the patient is very well; looking after her household duties, with seven children to look after. Her urine is normal.

The diagnosis of tubercular disease of the female urinary tract is by no means an easy one at all times. Now and then it is readily made.

Every case of pyuria should be examined for tubercular bacilli when the cause cannot readily be ascribed to some other infection. The sensitiveness of the bladder to the touch per vaginam is an important symptom in vaginal tuberculosis. As we pass the finger up the anterior wall of the vagina to the cervix and then direct it, with its palmar surface forward, to one and then to the other side, we may find a thickened ureter. The normal ureters can nearly always be felt as very thin cords converging towards the neck of the bladder and losing themselves little less than an inch above the internal opening of that organ. If the finger is placed at the side of the cervix and close to it, the outer edge of the finger will correspond to the location of the ureter.

The ureter, when it is thickened and inflamed by tubercular disease, becomes a very sensitive cord.

In the beginning, the small ulcerated surface is surrounded by small blisters, as a fine herpetic eruption might appear.

When these objective symptoms, coupled with such sub-

jective symptoms as have already been spoken of, present them-
selves, the diagnosis is absolute. We shall not always be able
to find all symptoms, and many times will fail to demonstrate
the tubercle bacillus. In the latter case the diagnosis becomes
dubious.

The *prognosis* in tubercular disease of the urinary tract is
usually considered a bad one. Nevertheless, there are cases
that appear to get well and remain so for years. The following
cases are examples in question.

CASE VIII.—*Tubercular Bladder and Right Ureter; Pyuria
with Many Tubercle Bacilli; Apparent Cure.*

Miss M. O., aged eighteen years, was seen in 1891 with
symptoms of bladder trouble, *i.e.*, frequent and painful urination.
An examination of her urine showed many tubercle bacilli and
pus, while the bladder contained many tubercular ulcers in the
trigonum and the right ureter was sensitive and thickened. For
some years she was under the care of the late Dr. Emma W.
Edwards, and became very well. Later she was married and
gave birth to a child. At the present time, twelve years after I
first saw her, she considers herself well.

CASE IX.—*Tubercular Right Kidney and Bladder; Pyuria
with Many Tubercle Bacilli; Apparent Cure.*

Miss F., single, aged thirty years, was taken sick with blad-
der symptoms in 1893. From then on she had frequent attacks
of painful and frequent urination, and was often confined to her
bed with pain. In 1895 she took up the training as a nurse.
September 11, 1897, I saw her with Dr. Mead in an exceptionally
acute attack of pain in the bladder. The urine was found to
contain large quantities of pus and tubercle bacilli. Her tem-
perature at that time was 104° F., and she gave one the impres-
sion of being a very sick woman.

The right kidney was prolapsed and very sensitive. Cathe-
terization failed because of the extensive tubercular ulcerations
of the bladder. For two years tubercle bacilli were constantly
found in the urine, but since three years the urine has appeared
perfectly normal. While she still has occasional pain in the blad-
der, there is no pus in the urine.

From 1897 to 1899 she was treated by Dr. Mead with creo-

sote, sandal-wood oil, and various tonics. Eggs and milk were an important part of her diet. At the present time she is suffering from some affection of the vocal cords, but no tubercular ulcerations are visible.

The very chronic course of the disease is well illustrated in the following case.

CASE X.—*Tubercular Left Kidney and Ureter; Tubercular Cystitis.*

About September, 1890, I saw Miss D., aged twenty-three years, a teacher by occupation, who in her early childhood had caries of the spine and is much deformed. For some months she complained of much and constant pain in the left lumbar and iliac region, with frequent urination. The pain at times was hardly bearable, and she often took paregoric to relieve it.

An examination showed an extensive tubercular ulceration between the openings of the ureters. The left ureter was considerably thickened, the right one less so, and the urine contained an occasional tubercle bacillus.

A general tonic treatment and irrigation of the bladder gave her some relief, so that she took up mission work, but had rather a miserable existence. Her condition gradually became quiescent, and in 1898 she took upon herself the care of a country home for crippled children. Here she led much of an out-door life, and at the date of this writing considers herself tolerably well, though I have not been able to see her nor examine the condition of her urine.

These are the only cases I have been able to follow for many years. Some cases prove fatal rather slowly, while in others general tuberculosis soon kills the patient.

CASE XI.—*Symptoms of General Tuberculosis followed by Tubercular Right Kidney and Ureter and Ulceration of the Bladder; Death in a Few Years from General Tuberculosis.*

Mrs. S. H. was sent to me October 7, 1897, by Dr. Lewis, of Morristown, who kindly gave me the following history: The patient had been sick more or less since six months. She complained of fatigue, painful and scanty menses, and irregular

fever, with chills. She was anæmic and losing flesh. Three months previous to her visit to me she had a slight cough and scanty expectoration, in which the bacteriologist could not find any tubercle bacilli. A second examination likewise proved negative.

About this time she began complaining at urination, which was painful at the end of the act, but not more frequent than usual. With this there was some pain in the loins and over the region of the bladder. Dr. Lewis reports pus, mucus, and occasionally blood in the urine at this time. On one occasion she had a real renal colic.

When seen by me, October 7, 1901, the bladder was sensitive to the touch, as was also the right ureter, which was much thickened as far as the finger could reach. The interspace between the ureters in the bladder was covered with small tubercular ulcerations. The urine was kindly examined by Dr. R. N. Connelly, who reported tubercle bacilli, pus, and fibrous tissue cells in great numbers, besides albumen and pus casts.

Her previous history indicating a general infection, a bad prognosis was made and a general tonic treatment advised. Dr. Lewis carried this out, giving her besides, for some months at a time, creosote. During 1899 and 1900 it seemed as if she was going to recover. Her bladder symptoms were much ameliorated and her general condition much improved. But later she relapsed, and died from general tuberculosis. Bacilli had been found in the sputum long before this. She died in the spring of 1901, or four years from the beginning of her illness.

The rapidly fatal cases in spite of operation are illustrated by the following:

CASE XII.—*Tubercular Right Kidney, Ureter, and Bladder; Nephro-ureterectomy; Recovery from Operation; Death within Two Years from General Tuberculosis.*

Mrs. E. W., aged thirty years, married, one child, presented herself October 26, 1901, in very poor health. The family history is reported as good. She has had constant pain in the right kidney followed by general weakness. She had no cough, but there was some suspicion of an apex difficulty. The urine was loaded with pus and tubercle bacilli. Upon catheterization, the

left kidney appeared normal. The right ureter was much thickened and the bladder covered with tubercular ulcerations.

Because of her great suffering and the evident progressive condition of the disease, her right kidney and ureter were removed, as in the foregoing cases. The ureter was accidentally torn off, but was soon found again and removed down to the bladder. How much the accident may have to do with her general infection I am unable to say. The wounds were closed with drainage, and the patient discharged in very good condition in four weeks. She remained comparatively well for some months, but then developed a cough, and died nearly one and a half years later from tuberculosis of the lungs.

In spite of the foregoing case, one can conscientiously recommend the operation of nephro-ureterectomy in those instances where the tubercular process is confined to the ureter and kidney, or that have originated in those organs, as such good results are shown by the cases already reported.

That cases do get well, or at least remain quiescent, is unquestionable. When operation is counterindicated, such treatment as is recommended for tuberculosis elsewhere should be instituted. Among those, fresh air, plenty of water, good, easily digested, and wholesome food, tonics, and such medicine like creosote, cystogen, and cod-liver oil find a useful field.

To finish a report of all my nephro-ureterectomies, the following two cases are herewith appended.

CASE XIII.—*Tubercular Left Kidney, Ureter, and Bladder; Nephro-ureterectomy; Recovery from Operation.*

Miss I. M. presented herself, at the suggestion of Dr. Charles Young, February 12, 1903. She was seventeen years old, single, had been well heretofore except when sick with typhoid two years ago. She also had albumen in the urine at that time. She began to have pain in the left lumbar and iliac region, which she dated from a fall in September, 1902. The pain gradually extended down into the left iliac and vaginal regions. Soon there was a constant desire to pass water. She gets up from three to seven times during the night for that purpose. An examination revealed that she had retro-left lateral position of the uterus, a very much thickened left ureter, and that her urine was loaded with

pus and tubercle bacilli. The right ureter was catheterized and nothing abnormal discovered. February 26 a nephro-ureterectomy was performed. Unfortunately, she became septic, but soon recovered from the acute symptoms after the use of Dr. R.

FIG. 2.
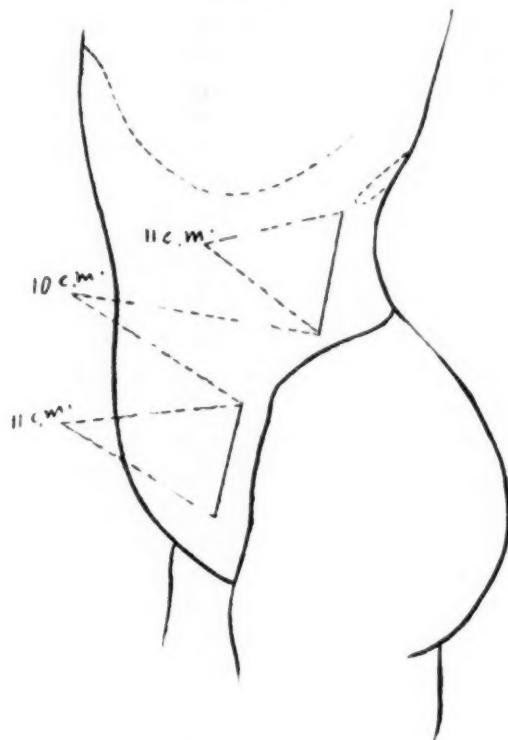
Case XIII, showing location of incisions for removal of ureter.

N. Connelly's antitoxin serum and a wide opening of the wound. There was left a fistulous tract in the latter part of May. At this same time she gained flesh rapidly, in spite of the fact that her urine contained pus. Tubercle bacilli were still found on June 18.

CASE XIV.—*Tubercular Left Kidney, Ureter, and Bladder; Nephro-ureterectomy; Death in Forty-eight Hours from Sepsis.*

A. G., aged nineteen years, single, father died of phthisis, general health is poor, entered St. Michael's Hospital March 2,

TABLE OF SEVEN CASES OF COMPLETE NEPHRO-URETERECTOMY FOR TUBERCULOSIS.

No.	Name.	Age.	Social Condition.	Date of Operation.	Diagnosis before Operation.	Diagnosis after Operation.	Bacteriological and Microscopical Examination of Urine.	Early Symptoms.	Immediate Result.	Remote Result.	Remarks.
1	R.	27	Single.	May 24, 1899.	Tubercular bladder, left kidney and ureter.	The same.	Pus, tubercle bacilli, connective-tissue later, painful urination.	Pain in left loin and iliac region; later, painful urination.	Recovery.	Neither pus nor tubercle bacilli in the urine within a year.	Was married a year after the operation.
2	E. B.	22	Single.	April 9, 1901.	Tubercular bladder, right kidney and ureter.	The same.	Pus, tubercle bacilli, connective-tissue particles.	Pain in the right lumbar region; later, dysuria.	Recovery.	December 4, 1902, urine normal.	Is in perfect health; became septic after the operation, but recovered after some months.
3	S. S.	24	Married, two children.	June 28, 1901.	Tubercular bladder, right kidney and ureter.	The same.	Pus, tubercle bacilli, connective-tissue particles.	Pain in the right iliac region; later, dysuria.	Recovery.	Urine normal, May 28, 1903.	Had a normal pregnancy and labor eighteen months after operation.
4	E. W.	30	Married, one child.	October 30, 1901.	Tubercular bladder, right kidney and ureter.	The same.	Pus, tubercle bacilli, connective-tissue particles.	Painful urination.	Recovery.	Died in eighteen months from tubercular phthisis.	Never entirely recovered from her urinary symptoms, though she was much improved.
5	S. C.	39	Married, seven children.	December 1, 1903.	Calculus in pelvis of right kidney.	Tubercular right kidney and ureter.	Blood in the urine in large quantity; no bacilli.	Pain in the right lumbar region.	Recovery.	May 17, 1903, is perfectly well.	....
6	T. M.	17	Single.	February 26, 1903.	Tubercular bladder, left kidney and ureter.	The same.	Tubercle bacilli, pus, connective-tissue particles.	Pain in the left iliac region; later, frequent urination.	Recovery.	June 18, 1902, urine contained some pus and tubercle bacilli.	The wound became septic, but in due time the girl got well.
7	A. G.	19	Single.	March 28, 1903.	Tubercular bladder, left kidney and ureter.	The same.	Pus and tubercle bacilli.	Pain in the left loin.	Recovery.	Septic, death in two days.	....

TABLE OF TWO CASES OF NEPHRECTOMY FOR TUBERCULOSIS.

No.	Name.	Age.	Social Condition.	Date of Operation.	Diagnosis before Operation.	Diagnosis after Operation.	Bacteriological and Microscopical Examination of Urine.	Early Symptoms.	Immediate Result.	Remote Result.	Remarks.
1	R. W.	35	Single.	March 5, 1901.	Tubercular bladder, right ureter and kidney.	The same.	Pus, tubercle bacilli, and tissue particles.	Pain in the right lumbar region.	Recovery.	Was well when last heard from in March, 1903.	The very miserable condition of the patient prevented a complete nephro-ureterectomy.
2	A. M.	44	Married.	January 29, 1903.	Probably cancer of the left kidney.	Tubercular pyelitis.	Blood in the urine coming from the left ureter.	Hæmaturia, pain in the left loin.	Recovery.	Well when last heard from.	Urine cleared up in a week; diagnosis was made by the pathologist only.

1903. Menstruation irregular, with some pain and scanty flow. She was hoarse, and had been so for some months, but no lesion of the vocal cords was discovered. For two years she has had pain in the left loin, and since three months complains of scalding on urinating and sharp shooting pain in the bladder at all times. She makes the impression of a patient suffering greatly. An examination was exceedingly painful, and she was therefore placed under ether for that purpose. There was a much thickened left ureter and tubercular ulcers in the lower posterior half of the bladder. March 28 the left kidney and ureter were removed down to the bladder. After the operation, the patient vomited incessantly; her temperature rose rapidly, and she died in less than forty-eight hours of acute sepsis.

CONTRIBUTION TO THE SURGERY OF PYOSALPINX.

BY R. C. COFFEY, M.D.,
OF PORTLAND, OREGON.

DURING the past three years I have performed sixty-five operations for pyosalpinx. Twenty-nine of these have been by vaginal operation, seventeen of the twenty-nine being total ablation; three have been removal of tubes without the uterus; nine have been cul-de-sac drainage; thirty-five have been done by the abdominal method, ten of which were drained through the cul-de-sac; three of the ten were drained through the cul-de-sac and abdominal wound, and twenty-two were not drained. Temporary fæcal fistula developed in two cases which were drained, both of which have closed spontaneously. In all of the abdominal operations except the three mentioned, the abdominal wall has been closed by layers of catgut reinforced by several silkworm-gut sutures passing through the skin fascia and muscle, and a subcuticular silkworm gut to close skin accurately. In eighteen of the thirty-five abdominal cases at least one of the tubes has been ruptured during the operation. In six of the cases slight suppuration has taken place in the abdominal wall. Of the sixty-five cases operated upon no death has occurred either from the abdominal operations or from the vaginal operations. In one of the cases, which was an acute case and was drained through the cul-de-sac, the abdominal wound suppurated at the time, but patient recovered with no serious drawback. Later, she again took sick, and fell into the hands of another surgeon, who I understand found a large pus accumulation in the pelvic cavity extending well up the abdomen. I was never able to learn what the cause of the suppuration at this late date was, unless it was to some large catgut which was used at the time of the operation in tying off the pedicle, which was done by transfixion, owing to the acute-
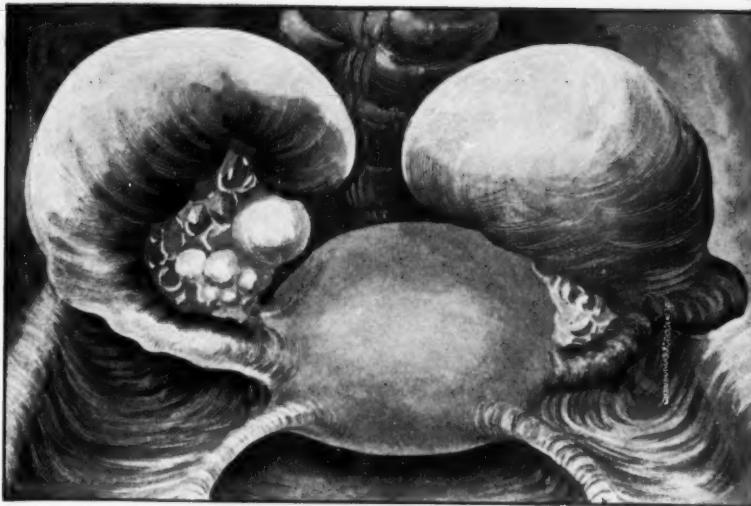
FIG. 1.—Average case of uncomplicated case of pyosalpinx, showing cystic ovaries.
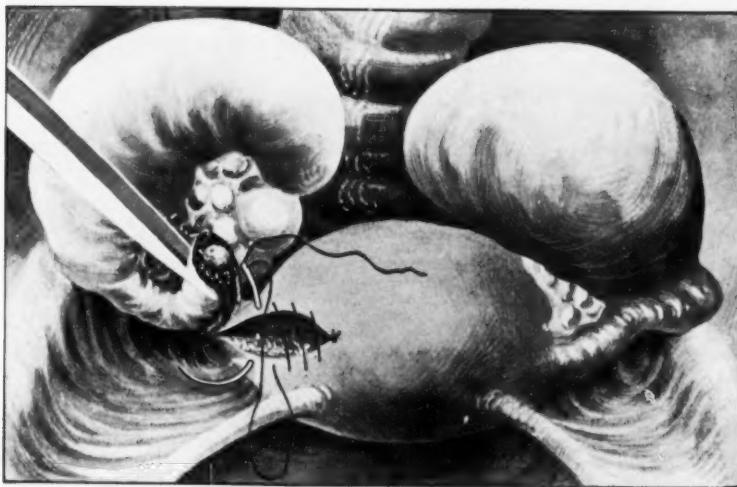
FIG. 2.—Exsecting the uterine end of the tube and closing with continuous catgut suture.
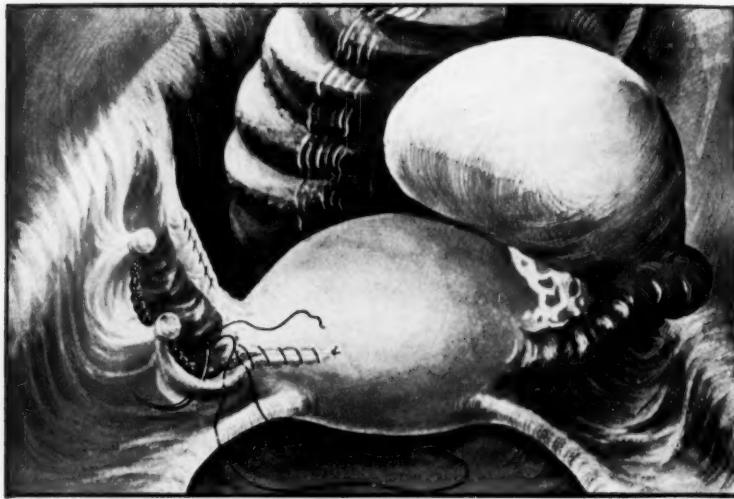
FIG. 3.—Stumps after removal of tube and cystic portion of ovary; beginning the suturing peritoneum of broad ligament to uterine body.
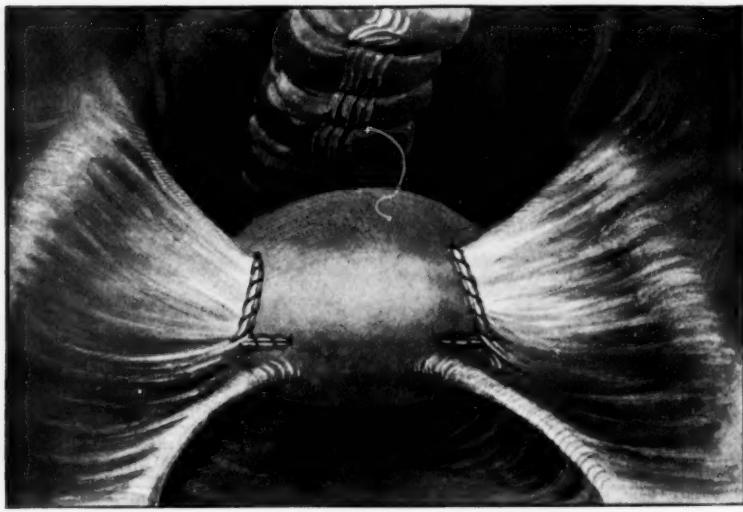

FIG. 4.—Both tubes have been removed; portions of each ovary have been removed, and with the stumps of the broad ligament are suspended under the roof made by the attachment of the peritoneum of the broad ligament to the uterine body.

ness of the infection and urgency of the case. Of these cases, thirty-eight were done during the year of 1902, including the last month of 1901. In only two of the abdominal cases has it been necessary to remove both ovaries entirely. In every case from which I have been able to hear menstruation has gone on the same as if no operation had been done, provided a portion of an ovary has been left. The patients are universally feeling well as far as I have been able to learn.

From my own experience, I have gradually developed a technique something like the following: After the abdominal incision has been made, first see if it is possible to push the intestines upward towards the diaphragm, and hold them by packing in gauze sponges; second, seek the fundus of the uterus. Having made way to the uterus, gradually insinuate the finger along the posterior surface until the cul-de-sac has been reached. Carry a gauze sponge down between the fingers and the uterus. From this point of cleavage separate adhesions from the centre as much as possible, gradually filling the space made with gauze sponges. As fast as possible separate adhesions of the intestines and push them back towards the diaphragm until they are well out of the way and a thick wall of gauze sponges separates the field of operation from the general abdominal cavity. Now gradually separate the adhesions holding down the tubes and lift the uterus as high as possible with vulsellum forceps. Fig. 1 represents a drawing I have had made illustrating an average uncomplicated case of double pyosalpinx, or one in which the adhesions holding the tubes down have been broken up. The first step in the actual operation is to exsect the tube by a V-shaped incision in the cornus of the uterus as shown in Fig. 2. Follow this up with a continuous catgut until the V-shaped incision has been almost closed. Put down this needle and thread; lift the tube as high as possible; ligate the web or ligament of the tube in three or four different sections with catgut, as close as is consistent. A certain amount of comparatively healthy and active ovarian tissue may be found at the base of almost every ovary, no matter how cystic. Remove all the cystic portion, making, if

possible, a V-shaped incision, which is to be closed with a very
fine catgut. This leaves a condition shown in Fig. 3. Now
take up the needle and continuous catgut suture which has been
used to close the V-shaped uterine incision, pass the needle
through the peritoneum just external to the line of stumps
(Fig. 3), then the side of the uterus, then through the peri-
toneum, back to the side of the uterus, and so on until the
peritoneum forming the web or ligament of the tube has been
brought in contact with the side and back of the uterus (Fig.
4). After this has been done, it is found that the raw stumps
are hidden and in contact with the back and side of the uterus
The ovary is suspended by its normal ligament under a roof
made of the peritoneum of the broad ligament, and is thus
protected from contact with the intestines above (Fig. 4).
The other tube and ovary are treated likewise. Owing to the
fact that very many of these cases tend to retroversion of the
uterus, I have supplemented this part of the operation by what
I have called, for want of a better name, posterior advance-
ment of the round ligament (Fig. 5), which is done by seizing
the round ligament an inch or an inch and a half from its
uterine attachment and bringing a knuckle backward to be
stitched to the posterior and lateral surfaces of the uterus and
broad ligament by a line of catgut sutures, as shown in the
drawing. This holds the uterus in its normal position. In
the great majority of cases every raw surface may be covered
up by this method. If there should be infection of the ovary
or in the stump following the operation, there is but one place
for an accumulation to take place, namely, in the cul-de-sac,
where it will do the least possible damage and be most easily
reached.

I believe drainage to be unnecessary except in acute cases,
as the pus in a large per cent. of cases is sterile. When drain-
age is to be used, I think it is certainly better and more satis-
factory in every way to drain through the cul-de-sac, using two
rubber tubes and two or three wicks of gauze. A rubber tube
without the gauze does not retain its place well and does not
always drain perfectly, while a simple gauze drain acting by

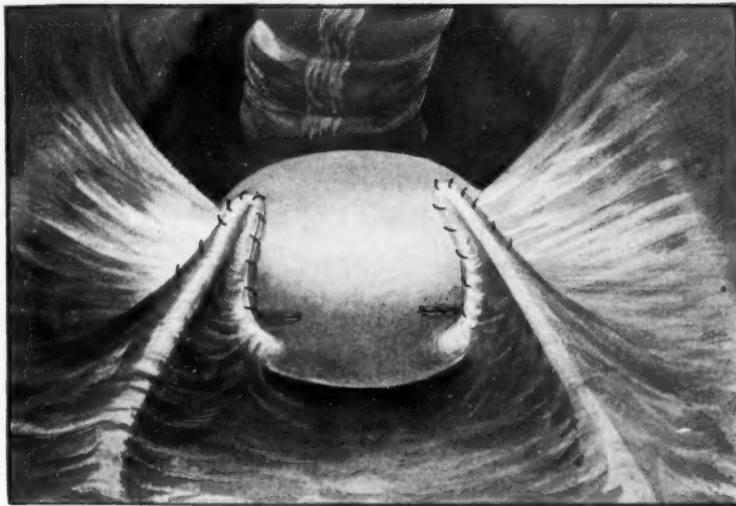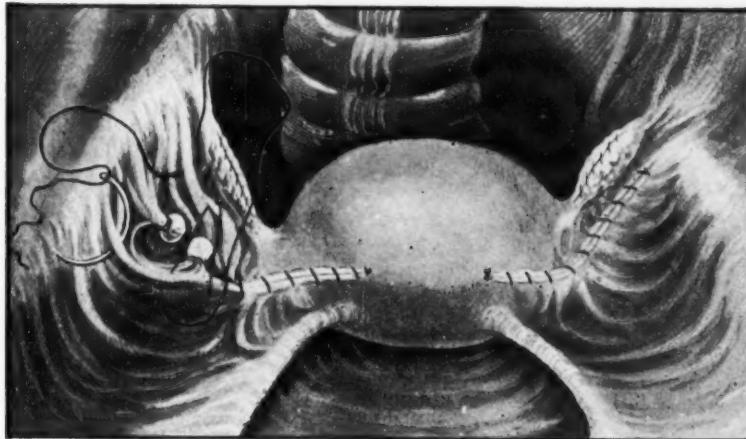FIG. 5.—Posterior advancement of the round ligaments.

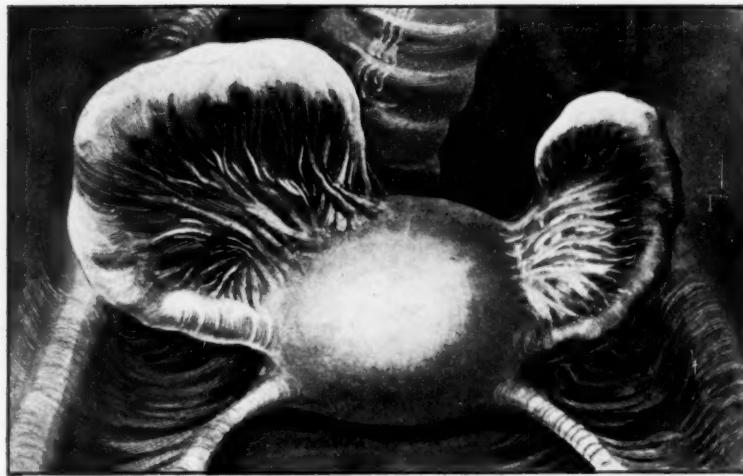FIG. 6.—Another simple and easy way of disposing of stumps and raw surfaces.

FIG. 7.—Double salpingitis with resulting adhesions of long standing; ovaries both embedded and both fimbriated extremities closed.

FIG. 8.—Right tube and ovary removed; left tube opened and edges everted; catgut inserted in open tube; portion of ovary exsected.

capillary traction does not drain well when applied from below.
The combined drainage will always be found to act well. Ab-
dominal drainage is unnecessary except to drain an abscess
which extends unto the vesico-uterine space or far out into the
folds of the broad ligament.

As an example, I will mention one case which is illus-
trated in the last two drawings. Fig. 7 shows the results of
repeated attacks of salpingitis. The patient was only twenty-
six years of age and desired to bear a child. She insisted very
strongly upon not having both tubes removed. Upon opening
the abdomen the right tube was found to contain pus. The
right ovary was very cystic and covered in with adhesions.
The left tube was closed and bound down by adhesions which
completely embedded the ovary. There was no acute inflam-
mation present. The left tube had apparently emptied itself
into the uterus. Instead of removing this tube, the adhesions
were dissected away with scissors, and a portion of the ovary
which was cystic was removed. The edge of the tube was
opened with scissors, and the edges of the tube everted by a
catgut suture turning back the edges of the incision (Fig. 8).
In order to be sure that the opening would not again be closed
by the omentum, a number two catgut was doubled, twisted,
and inserted into the opening of the tube for about two inches,
the outer end being held by a small interrupted catgut suture.
The patient made a good recovery and is in perfect health, but
has not yet conceived.

I report this case to bring out this method of opening a
closed tube, in case pus has apparently drained into the uterus.
Both tube and ovary were removed on the right side.

In summing up the advantages of this method, I would
state the following:

First. In the light of modern technique in abdominal sur-
gery, the mortality in the hands of a competent operator is very
little.

Second. Every raw surface is covered with peritoneum
if possible, and directed so it will drain into the cul-de-sac.

Third. Future complications and adhesions are almost

altogether prevented by exsecting the tube from the cornu of
the uterus with a V-shaped incision, suturing the incision with
catgut and bringing the peritoneum of the broad ligament
and the stumps in contact with the uterine body. In this way
the ovary and raw surfaces are all turned into the cul-de-sac,
are sheltered by the overlying peritoneum from adhesions, and
all broken areas are brought into the cul-de-sac within easy
reach in case of infection of either the uterus or remaining
ovarian tissue.

Fourth. Owing to the tendency of the uterus to be drawn
backward by adhesions, a posterior advancement of the round
and broad ligament, as shown in Fig. 5, serves a valuable
purpose.

Fifth. By this operation no vessel is tied which under
ordinary circumstances would produce death from hæmor-
rhage, even though all ligatures slip.

Sixth. All the normal womanly functions can be main-
tained except child-bearing in almost all cases. The woman is
spared the moral effect of a premature menopause. By cover-
ing in all stumps and raw surfaces, but few adhesions form,
and very few of the pains we formerly noticed following these
operations are found. I believe the method of operation here
represented is conservative surgery in that none of the normal
functions and sensations of the woman are destroyed. It is
finished surgery in that all seriously diseased structures have
been removed, all raw surfaces have been covered, and the
uterus has been anchored in its normal position.

CONGENITAL LUXATION OF THE ANKLE.[1]

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In all of the reported cases which I have been able to find, congenital luxation of the ankle has been associated with defect of the fibula. These cases have been divided by Hoffa into two classes. In the one the defect of the fibula has been associated with angular deformity of the tibia and defective development of the foot; in the other, the foot has been of normal shape, but the outward deviation of the foot upon the leg has been ascribable to the imperfect development of the external malleolus, depriving the astragalar mortise of its outer part, and to the obliquity of the articular surface of the tibia. The case which is herewith reported belongs in the second class, for the reason that the obliquity of the joint line and normal condition of foot and toes are evident. It would appear to be of especial interest, however, because the fibula is present throughout its course, being possibly thicker than normal, and because it seems possible to draw rather definite conclusions from it regarding the etiology of this whole group of cases.

The patient, a girl of twenty-four months, is the daughter of a baker, and was brought by her father to the dispensary of the Medical College of Ohio. The deformity of the left ankle had been noticed from birth, and its correction had been attempted by desultory courses of manipulation and massage, but without effect. From the first, attempts at walking were attended with great difficulty, but the child has learned to walk with a peculiar limp. Upon walking a short distance, the child complains of fatigue, and finally of pain. There have been no congenital malformations in other members of the family (four other

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[1] Presented to the American Orthopædic Association, May, 1903.

children). The pregnancy and labor of the mother were absolutely uncomplicated. The father acknowledged having had a venereal sore many years ago, for which he was treated, and which has been followed by no symptoms of constitutional lues. His other children, according to his statement, have shown no signs of this disease, the mother never miscarried, and all of her children are living.

The child has always been in good health. There have been none of the symptoms of rickets. There is no rosary, and the epiphyses of the other long bones are of normal size. The head is of normal shape. The gait is a peculiar limp, showing great weakness in the left limb, and the pelvis is seen to descend with the application of the left foot. The whole plantar surface is brought into contact with the ground. The photograph shows the outward displacement of the foot upon the leg when weight is borne, but not nearly to the true extent. The child had to be held by the father for the picture, but kept the knees somewhat flexed. The feet are both very flat, but are not everted in walking or standing. Even in recumbency the left foot had its axis in a plane decidedly lateral to that of the leg. The internal malleolus appears prominently, and the external also can be seen. They are both felt to be enlarged, but especially the external, which lies in a plane decidedly above that of the other. Passive motion of the ankle shows the joint line to be oblique from without inward and downward. Almost the full normal range of motion is present. The internal contour of the limb is quite straight; the external presents a marked indentation above the ankle. There was no scar or dimple of the skin at this place. The fibula can be felt throughout its length. The feet are of equal size and present no abnormality of development. The legs are of equal length. The child is otherwise perfectly developed and healthy.

The child was so unruly that the radiogram was made with difficulty. It was, however, sufficiently successful to show the conditions satisfactorily. It is at once seen that the fibula is present in its entire length, but that its shaft is greatly curved inward, diminishing greatly the width of the interosseous space. The bone appears thick in comparison with the tibia. The diameter of the latter on the radiogram is 12.0 millimetres at the
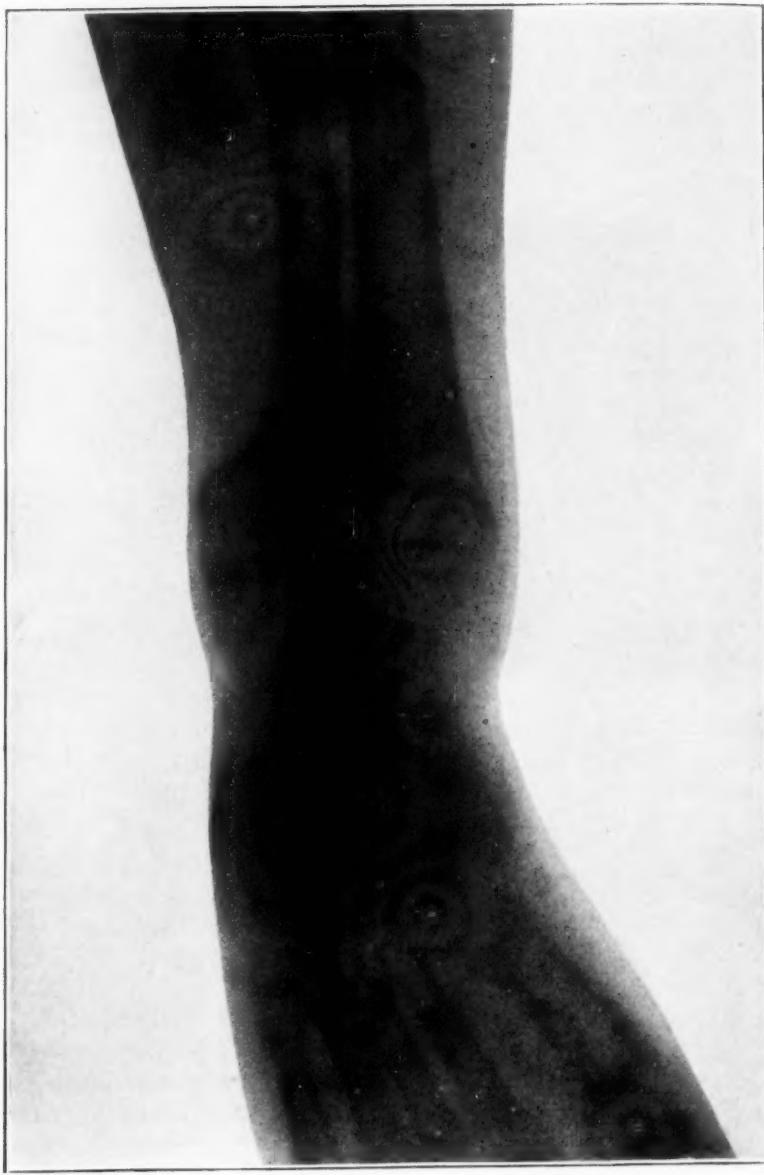
FIG. 1.—Congenital dislocation of the ankle.

FIG. 2.—Congenital dislocation of the ankle.

middle, while that of the fibula is 8.0 millimetres at a corresponding point. It is in the ankle-joint, however, that the most interesting condition is found. Instead of being distinctly lower than the inferior tibial epiphysis, that of the fibula is higher. The joint line is at an angle of seventy-five degrees with the axis of the leg, slanting from without inward and downward. On the tracing made over the negative, therefore representing the limb in recumbency, the axis of the leg falls to the inner side of the astragalus altogether. It appears to me perfectly justifiable, on this account, to consider this a congenital dislocation of the ankle-joint.

It was proposed to do osteotomy of the fibula in the hope of bringing down the external malleolus, with possibly the same operation upon the tibia in order to correct the obliquity of the joint line. All operative interference was, however, declined, and the child disappeared from view.

As far as I have been able to ascertain, the case is unique, and its practical interest is therefore not great. In endeavoring to account for its production, it appeared to me to stand in an interesting etiological relation to the cases of defective fibula. The most commonly accepted view of their causation is that of Sperling (*Zeitschrift für Geburtshülfe und Gynäkologie*, 1892), which assumes the pressure of a too narrow amnion early in the embryonal period. In the present instance, it would appear that the curvature of the fibula must have been produced by some such pressure,—pressure great enough to simply bend the developing fibula, but not enough to interfere with its further development. Whether the joint line was oblique at birth, it is impossible to say. This may have developed in consequence of the abnormal function of the joint during the second year of life. The same may be said of the thickness of the fibula. In weight-bearing, the astragalus was under the lower fibular epiphysis, and it is therefore probable that the fibula transmitted considerable stress to the foot.

In all of its physical characters, it seems to me, this case would correspond to an incomplete form of the so-called

" Volkmann's Congenital Ankle Deformity" in so far as the fibula has its bony structure intact. It is furthermore almost self-evident to me that the curvature of the fibula against the straight tibia could have been brought about only by pressure upon it against the tibia. To this extent, this case seems to corroborate the theory of amniotic pressure in the production of defective fibulæ and the deformities thereupon consequent.

Haudeck (*Zeitschrift für Orthopädische Chirurgie*, Band lv, p. 338) gives an extended discussion and complete bibliography of the subject.

THE TREATMENT OF THE COMPLICATIONS ATTENDANT UPON CHRONIC GALL-STONE DISEASE.[1]

BY JOHN B. DEAVER, M.D.,

OF PHILADELPHIA,

Surgeon-in-Chief to the German Hospital.

It is well established that in acute obstruction of the common duct operation is not to be thought of until increasing jaundice or a period of chronicity with fever and rapid pulse indicate the need of such interference.

The dangers of suppurative cholangeitis and cholecystitis have been realized for some time, and until hepatic drainage was practised by surgeons, such cases went in too many instances the wrong direction.

Chronic gall-stone obstruction, either with its increasing jaundice or the intermittent form, has called for surgical intervention because of the liability of such stones to cause strictures, ulceration, carcinoma, fistulæ, or damage to the pancreas, and to aid in the production of suppuration of the liver ducts, when infection becomes superadded. As infection of a varying degree is practically always associated with the formation of gall-stones, and as such infection is surely accompanied by a catarrhal condition of the mucous membrane of the common duct, the presence of a calculus, even if not sufficient in size to produce jaundice, will impair the drainage of the duct and induce a train of symptoms causing chronic invalidism.

Practically every case of gall-stone disease which starts with an infection is accompanied by a degree of cholecystitis sufficing to cause adhesions among the omentum, colon, duodenum, stomach, and biliary tracts. The dragging effect of these adhesions, the hinderance to the peristaltic action of the intestinal canal, the obstruction of the free action of the py-

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lorus, and consequent dilatation or ptosis of the stomach, are all of sufficient importance to cause symptoms requiring relief. The resources of the attending physician will be taxed to the uttermost to relieve his patient. Lavage of the stomach, change of air and scene, the employment of various cathartics, abdominal massage and gymnastics will be tried one after the other, and all in vain. It is here that surgery offers relief, and especially with the perfection of technique which, *in the absence of infection,* should result in a most favorable manner.

The preparation for a gall-stone operation differs in no-wise from that of any other, except in the presence of jaundice, when calcium chloride may be administered for three or four days previous to operation, in doses of twenty to thirty grains, three times a day. The use of a sand-pillow is a useful adjunct in order to arch the spinal column and give a better exposure to the gall-bladder region. I usually have it placed somewhat below the liver level, which is the point recommended by Mayo Robson, and place the table in a slight Trendelenburg position, three or four inches.

As to the incision, I fail to see any advantage in that made by Kehr; it is not only unnecessarily long, but by dividing two-thirds of the rectus muscle must certainly predispose towards hernia. The incision originated by Mayo Robson gives a perfectly satisfactory exposure of the field of operation, and by splitting the rectus muscle, instead of dividing it, will assure a much stronger abdominal wall. After opening the peritoneum and inspecting the field of operation, the intestines are best kept out of the way by a few well-placed gauze pads, and over these several flat marine sponges. I use the latter because, in spite of all precautions, some bile occasionally " spills," and the sponges soak up the fluid better and more quickly than gauze.

In disposing the gauze and sponges, particular care must be given to the subhepatic space and the region above and below the gastrohepatic omentum. The retention of purulent products in any of these fossæ may give rise to serious conse-quences later. I hardly believe that Kehr's method of perform-

ing hepatopexy by stitching the liver to the posterior parietal peritoneum is necessary.

The preparation of the field of operation calls for the expenditure of some time and attention to detail. I would no more think of cutting adhesions or searching for a stone without having protected the general peritoneal cavity, than I would rupture a peri-appendiceal abscess in the absence of adequate gauze protection to the intestines.

Adhesions should then be dealt with; and while in some cases a few ligatures and the use of the finger and scissors will be sufficient, in others the most extensive and careful dissection will be called for. Every band of adhesion should be carefully tied and divided, and in the separation of those of a more voluminous nature bleeding should be guarded against by the closest scrutiny.

After freeing the adhesions, the gall-bladder becomes exposed, and the right free border of the gastrohepatic omentum is traced to the duodenum. The gall-bladder holds the same relation to the common duct that the anterior longitudinal band of the cæcum does to the vermiform appendix, and the exposure of the gall-bladder and the free border of the omentum is the exposure of the field of the common duct.

A nice question may arise to be decided when a dilated and displaced stomach due to pericholecystic adhesions has caused marked gastro-intestinal symptoms. The great advances and the brilliant results of a gastro-enterostomy may well cause an operator to pause and consider whether he can successfully break up all constricting bands and prevent their recurrence, whereas a gastro-enterostomy in addition may cause complete relief of the symptoms. Personally, I believe one should be governed by the circumstances of each case; the risk of opening the stomach and intestine is not absolutely *nil*, and the necessity to avoid peristalsis for some hours after operation would perhaps cause extensive readherence of all raw surfaces.

Fistulæ may be directly caused by adhesions of the ulcerating gall-bladder or duct to a neighboring viscus with subse-

quent perforation. They have been observed between the biliary passages and the stomach, duodenum, jejunum, ileum, colon, urinary passages, thorax, abdominal walls, retroperitoneal tissues, and portal vein. In most instances the occurrence of fistula is impossible to diagnose, unless, for instance, a very large stone was passed in the stools or was vomited. As to the relative frequency of fistulæ, Naunyn tabulates forty-three fistulæ in a total of 10,866 autopsies; nineteen between the gallbladder and duodenum, sixteen between the gall-bladder and colon, five between the common duct and duodenum, and one each between the gall-bladder and stomach, gall-bladder and liver, and between the several bile ducts.

Fistulæ require great caution in their management in order to avoid soiling the peritoneum with bowel contents by inadvertently opening the intestine when cutting a supposed adhesion. These cases call for the expert use of the needle and thread, and require the operator to be the master of all situations and emergencies. The novice at such work may meet with insurmountable difficulties, and leave his patient no better, yes, worse off, than before the operation was undertaken.

The duodenum is sometimes superimposed on the gallbladder and border of the gastrohepatic omentum, enveloping them as it were, and requiring careful separation and the closure of the opening in the duodenum, if such be made. Such a case was encountered in my practice several weeks ago. In order to expose the right free border of the gastrohepatic omentum so as to be enabled to palpate the common duct, separation of the gall-bladder and duodenum was necessary, and it was found that nature had performed a cholecystoduodenostomy. The dissection was carried to the extent of freeing the border of the gastrohepatic omentum, when palpation revealed the presence of a stone occluding the common duct. The portion of the duodenum containing the opening was completely freed of adhesions, and the opening, which readily admitted the points of the middle and index finger, closed. The common duct was then opened, the stone extracted, and drainage introduced into the proximal end of the duct. The gall-bladder was

then excised close to the junction of the cystic with the common duct. Recovery was uneventful.

A second case, recently, disclosed a like condition, with the common duct communicating by a fistula with the stomach.

Fistulæ following cholecystostomy should close in a few weeks, and their permanence is due to the continuance of obstruction in the common duct, either from a stone or stricture. When the persisting fistula arises from the gall-bladder, a plastic operation should be attempted. Failing by this means, the gall-bladder must be isolated, the fistulous opening closed, a cholecystoduodenostomy performed or the gall-bladder removed; it being understood that the common duct is patulous.

In my experience, fistulæ from the common duct will ultimately heal, though often such healing is slow and tedious. Especial caution must be observed not to inject caustic or other irritating fluids into the fistula. If an operation is indicated, the opening must be sought, the stone or stricture removed, and the duct treated as in a primary stricture, as I will describe farther on. Thoracic and other biliary fistulæ must be opened up and treated according to the indications met with.

The field of lesion having been exposed, the point of lesion must be determined. Stones in the first part of the common duct are easy of removal by incising the duct over the stone, which serves the purpose of a director, and scooping out the stone. The hepatic duct must then be explored and the probe made to enter the duodenum as well, making sure that the probe can be felt through the wall of the duodenum. In case of doubt, the finger must be introduced into the common duct to determine the presence of a stone combined with palpation outside of the duct.

It is much safer to make a routine practice of draining the hepatic ducts than to close up the wound in the common duct with Lembert sutures.

Whenever practicable, the gall-bladder should be dissected free from the liver, ligated, and removed. It will be found to be shrunken and thickened, often containing a few gall-stones with inspissated bile. If the symptoms have been present for

some time without jaundice, a patent common duct can be assumed, and a cholecystectomy performed by a simple ligature with a few sutures to close the peritoneum over the stump.

With a stone in close proximity to the orifice of the cystic duct, the ectomy may be performed first, and the stone gently squeezed out of the remains of the cystic duct. Through the same opening the hepatic drainage can be carried, thus avoiding a double opening, and rendering a future stricture less liable to occur.

In the lower or duodenal end of the common duct more difficulty is encountered. I know of no harder operation in surgery than the effort to remove a stone from such a locality in the presence of numerous adhesions and a deep abdomen. If the stone cannot be forced back into the common duct, into the duodenum, or crushed between the fingers, or removed through an incision in the common duct, the duodenum should be opened through its anterior wall and the papilla slit up from within the duodenum. The stone can thus be reached, and with good technique the duodenum is closed without fear of having caused the escape of intestinal contents.

When the duct, immediately to the proximal side of the ampulla of Vater, is the site of a stone which cannot be crushed between the fingers or dislodged, the duct may be exposed by incising and reflecting the posterior parietal peritoneum to the outer side of the descending duodenum.

Stricture of the common duct sometimes follows ulceration and may cause chronic icterus. It will be detected when the probe searches for a stone in the duct, if not detected by the finger beforehand.

The treatment is somewhat difficult to decide. Perhaps the safest plan, and when the stricture is not absolute, would be to provide for a fistula from the gall-bladder to the duodenum. Where drainage of the hepatic duct was desired, or when the perfect patency of the cystic duct was questioned, the stricture should be divided and a T-shaped tube inserted, one arm extending into the hepatic duct, the other downward towards the duodenum, while the upright is brought out of the wound, as in any drainage operation. The object in using a T-shaped

drainage tube is to immediately establish direct communication between the two ends of the duct and to promote the formation of adhesions and exudates and their subsequent transfer into the walls of a new duct; as in the retention of a catheter in stricture of the urethra after perineal section.

Another method I have followed is to introduce a drainage tube into the hepaticus, and a second tube down the common duct to the head of the pancreas, but not so far as to obstruct the pancreatic duct. These tubes can be connected by a piece of glass tubing. Failing by all these methods, a permanent external or internal fistula would have to be encouraged.

Chronic pancreatitis is a more frequent condition than most of us are aware of, and may simulate very closely a carcinoma of the head of the pancreas. For this reason, I believe that in all cases of obstructive jaundice, where the condition of the patient will permit, an exploratory operation should be performed. If nothing but an enlarged and nodular head of the pancreas is found with the usual universal adhesions about it, even with enlargement of the portal lymphatics a cholecystostomy or a cholecystoduodenostomy should be made and the effect of drainage observed. It is surprising how rapidly the jaundice in some of these cases will clear up, the condition improve, and recovery result. I have had occasion in several cases to perform this operation upon patients who subsequently required reoperation for premature closing of this fistula, and have observed marked decrease in the size of the pancreas.

In this operation the gall-bladder is isolated with gauze and flat sponges and aspirated of its contents. The puncture is then enlarged and the gall-bladder examined for stones; if present, they may be removed with forceps or scoop. A small piece of iodoform gauze is introduced into the bladder and the opening temporarily closed with an hæmostatic forceps. The gall-bladder is then brought into the wound, if possible. A piece of gauze is placed around the gall-bladder in such a manner as to allow the lower end of the gauze to protrude from the lower end of the wound, and the gall-bladder is sutured to the aponeurotic layer of the abdominal wall. Before tying the

gall-bladder sutures the gauze pads are removed, but not the gauze around the gall-bladder. The sutures are tied, the wound in the abdominal wall above and below the gall-bladder closed, the hæmostatic forceps removed, the piece of iodoform gauze taken out of the gall-bladder, and a solid rubber drainage tube carried into the organ. This drains into a receptacle at the side of the bed. When it is impossible to bring the gall-bladder into a position favorable for its suture to the peritoneum, it must be protected by gauze packing after introducing the drainage tube. In such cases it is often safer, and especially where infection is suspected, to pack the gall-bladder off from the surrounding viscera, and a few days later to make the opening with the actual cautery. I have done this a number of times with success. After making the opening, drainage is provided for by introducing a rubber tube into the gall-bladder.

When the enlargement of the pancreas is not great, the jaundice not marked with enough color to the stools to show a patent common duct, and when the gall-bladder appears fairly normal in appearance, I make an internal fistula by a cholecystoduodenostomy.

After bringing the duodenum to the gall-bladder, an incision is made in both, and the half of a Murphy button placed in each. The excess of incision is closed with a few sutures (I never use the purse-string), and the halves of the button brought together. A couple of Lembert sutures may be inserted to perfect the anastomosis and complete the operation.

From a report up to 1897, which Dr. Murphy furnished to Mayo Robson, cholecystoduodenostomy had been performed with the aid of the anastomosis button in sixty-seven nonmalignant cases, with only three deaths, these being due to continuous hæmorrhage from laceration of the liver substance on the seventh day, to cholæmia on the fourth day, and to septicæmia on the fourth day, respectively. Of his twelve malignant cases ten died, giving a mortality of 83.3 per cent.

It is important, before performing this operation, to observe whether the cystic duct is unobstructed, because, if the gall-bladder is small on account of loss of function, the opera-

tion is useless. Should the cystic duct be partially or completely obliterated, hepatic drainage is indicated, and when the gall-bladder is diseased, its excision should be performed in addition. Anastomosis of the common duct and duodenum I have performed, but do not consider it a satisfactory procedure.

Hydrops of the gall-bladder is perhaps always due to a catarrhal inflammation (the result of infection) of the mucous membrane of the gall-bladder and with but slight, if any, infection. The mucous glands are stimulated to an advanced activity, and the condition presupposes an obstruction to the cystic duct by a stone, stricture, or swelling. Cholecystectomy is nearly always indicated, and only in certain cases where the infection of the smaller hepatic ducts is suspected to be persisting that a cholecystostomy is necessary. Under these circumstances the gall-bladder could be removed, cutting it flush with the common duct, and using the orifice of the cystic duct to drain the liver. The stump of the cystic duct should always be as short as possible to prevent retention therein of fragments of stone, mucus, etc.

Where the hydrops occurs in an already contracted gall-bladder with adhesions, the dissection from the liver-bed may be difficult and tedious. In such cases I place my gauze pads and sponges very carefully, and exert traction on the fundus of the gall-bladder. A curved incision close to the liver attachment is carried through the serous coat, and partly by the knife or scissors, partly with gauze as in freeing a hernial sac, the gall-bladder can frequently be readily stripped down to its neck and then ligated. If much oozing should occur from any denuded surface of the liver, a few sutures, or even the actual cautery, may be demanded, and thorough gauze packing made against the bleeding surface. In some of these cases Dr. Mayo's operation of enucleating the mucous membrane may be performed with good results. When the dissection is not carried far enough to remove all of the fibrous coat, bleeding from the cystic artery may require its separate ligation before performing the ectomy.

If the probe detects calculi in the common duct or in the hepatic duct, drainage of the latter must be performed in addition to the removal of the gall-bladder.

The question of drainage occupies a prominent place in the technique of all gall-bladder operations. There is never any doubt in the mind of the operator as to the wisdom of draining the suppurative forms of cholecystitis and cholangeitis.

With a gall-stone partially obstructing the common duct and a shrunken, thickened gall-bladder, the most rational operation at first would seem to consist in removing the stone, closing the duct, and excising the gall-bladder. In such cases, in addition to the tubular drainage, I place two strips of gauze, one leading to the stump of the gall-bladder, the other slightly spread beneath the wound in the common duct.

It is safer, however, to drain the hepatic duct at all times, not only on the stand-point of infection, but owing to the likelihood of overlooking stones in the hepatic ducts. Kehr even goes so far as to state that after choledochotomy with suture, " even the most skilled surgeon must count upon overlooking stones in 10 to 15 per cent. of his cases."

I use a smaller sized tube than the latter author when draining.

The question, When is the time of election for performing a surgical operation upon patients suffering with cholelithiasis? has been answered time and again by surgeons. Mayo Robson, in January of this year, believed that " as soon as gall-stones give serious trouble, their removal by operation is the most rational method of treatment, since it is only from the complications, which in many cases of cholelithiasis arise sooner or later, that any danger after operation may be apprehended."

It is my opinion, after a rich experience in complicated as well as uncomplicated cases, that operation should be resorted to as soon as it is definitely known that gall-stones are present.

In support of the lessened mortality and the greater ease in operating which early surgical intervention offers, the expe-

rience and brilliant results of Dr. William Mayo furnish an example and impetus which we would all do well to follow.

The recent statistics published by Kehr speak eloquently for the results of early operation, better than any words could attempt. In 535 uncomplicated laparotomies for gall-stones the mortality was 3.5 per cent. In seventy-one simultaneous operations in inoperable carcinoma of the gall-bladder, common duct, or liver, in diffused suppurative cholangeitis, diffused suppurative peritonitis, and sepsis the mortality was 97 per cent., nearly every case, sixty-nine out of seventy-one, succumbed to the deadly spread of infection or to carcinoma the result of chronic gall-stone irritation.

In 114 operations on the stomach, intestines, pancreas, liver, kidney, etc., 24 per cent. died. These cases were those in which extensive adhesions, chronic pancreatitis, or various changes in the liver and kidney made the operation difficult and the anæsthesia prolonged.

Gall-stones, *per se,* never kill, and fatal infectious cholangeitis is not common in the absence of a stone in the ducts. It is only in the presence of great adhesions, fistulæ, suppuration, pancreatitis, or disease of the liver and kidneys that the mortality rises in direct proportion to the grade of the complication.

Operation is particularly indicated in those cases of chronic calculous cholecystitis without jaundice, and with or without enlargement of the gall-bladder. Like the interval operation in appendicitis with a chronic low grade inflammation, perhaps a fæcal concretion, and with more or less adhesions, the removal of the diseased gall-bladder can be performed with as much celerity and safety as can the amputation of such an appendix.

Unoperated, they give rise to a train of symptoms driving the unfortunate patient to the stomach specialist or to places like Carlsbad. The stones are too large to possibly pass the cystic duct, and the low-grade inflammation is responsible, as I have said, for a sequel of symptoms which lead to chronic invalidism.

TROPICAL ABSCESS OF THE LIVER.

A REPORT OF MILITARY EXPERIENCE IN THE PHILIPPINES.

BY ERNEST F. ROBINSON, M.D.,

OF KANSAS CITY, MISSOURI.

As the extension of our territorial borders has presented
new problems for our consideration as citizens, so the service
and residence of our army in the tropics have furnished new
questions for our solution as physicians. Disease kills and
incapacitates far oftener than bullets in any warfare, but espe-
cially has this been true in our recent campaigns in the Orient.
The constant return to the United States of scores of invalided
soldiers has awakened a wide-spread interest in tropical dis-
eases. But among them none is more likely to be brought
intimately to the attention of the medical profession than ab-
scess of the liver. Its relation to dysentery is known, and
the frequent development of liver abscess late in the course
of this disease explains its appearance so often in the United
States.

From the earliest times dysentery has been the scourge of
armies, but in our own campaign in the Philippines we have
had added to the malevolent influences of the massing of great
bodies of men together the presence of an endemic disease.
The records of 16,210 sick and wounded treated at Reserve
Hospital in Manila for one year (March 1, 1899, 1900) were
carefully investigated by the writer, and it was found that
dysentery and diarrhœa were the cause of more than one-fifth
of the sickness in our army. In this year there were treated
at this hospital alone 2251 cases of diarrhœa and 1391 of pro-
nounced dysentery. Dysentery and diarrhœa followed directly
the course of the rainy season. During June, July, and August
the sick report was crowded with these cases. Often whole
companies would be stricken as with an epidemic. The sud-
den chilling and exposure of the first rains made the number

of cases during the month of June more than three times as
great as that of any other month. With the American in the
tropics dysentery is always present, and with it often abscess
of the liver. The conditions which favor the development of
the one make more evident the existence of the other.

Numerous statistics demonstrate this fact. In 3680 dysen-
tery autopsies made in various tropical countries and reported
by Manson, 21 per cent. showed abscess of the liver. The
exact number of cases among our own troops cannot be defi-
nitely stated, but the prevalence of the disease and its intimate
relation to amœbic dysentery is well shown by the examina-
tion of the records of ninety-six dysentery autopsies performed
at the First Reserve Hospital, Manila, during the year 1899.
At a majority of these I was present, although prevented from
taking an active part by the surgical rules of the hospital. Ab-
scess of the liver was present in twelve cases, over 12 per cent.
While this number is a small one on which to base a statistical
opinion, yet it gives very nearly the correct estimate of the per-
centage of liver abscesses developing in cases of chronic trop-
ical dysentery among Europeans. The native population in the
Philippines rarely develops this disease, although dysentery is
common among them. Not a single case of liver abscess was
seen among the natives in my own experience in the islands,
and I am informed by well-educated Spanish and Filipino
physicians that to them the disease was almost unknown. Sta-
tistics of autopsies upon the natives, however, are unfortunately
very meagre.

The life led by Europeans in the tropics doubtless explains
the frequency of liver abscess. Overeating and overdrinking,
together with lack of exercise, favor hepatic engorgement,
and the sudden chilling and exposure incident to the first few
months of residence furnish the exciting cause in the develop-
ment of an acute amœbic dysentery.

Although dysentery is without doubt a cause of tropical
abscess, the part played by the amœba coli in its development is
as yet undetermined. Whether it was a cause or result in our
own cases we have no evidence to offer. All were of the amœ-

bic type of dysentery. The organism was found either in the stools or the pathologic picture was so typical that search was not made for it. From the pus of the abscess, or the abscess wall itself, there is record of the amœba in only five cases. This should not, however, lead to the conclusion that the organism had not been present in the remainder, for most of these cases were of long standing, with great destruction of liver substance, and a sufficiently persistent search was not made in every one.

Only one case of liver abscess was not dysenteric, but was apparently a multiple idiopathic abscess. There was no history of dysentery or diarrhœa, nor any post-mortem evidence of previous amœbic infection, and the organism could not be obtained from the liver pus.

The length of time necessary for the development of liver abscess after the dysenteric attack differs very much. No definite time or period of incubation, so to speak, can be given. In several cases, symptoms referable to the liver were present almost from the outset of the disease, while in others an interval as great as two years intervened between the last attack of acute dysentery and marked symptoms of liver abscess. However, in the majority of cases, dysentery had existed several months. Previous wasting disease, as malaria or typhoid fever, did not seem to predispose to liver abscess. In fact, many of the cases occurred in men strong and robust, most of whom had never before been ill. The chronic alcoholic, however, seemed particularly susceptible. The severity of the initial attack of acute dysentery also seemed to materially increase the chances of liver infection.

Of the fourteen cases on our records, five were single and nine were multiple abscesses. As Manson very aptly remarks, " Whether the resulting abscess be single or multiple is more or less a matter of accident. If the weakened liver is efficiently inoculated at one point only there will be only one abscess; if at many points, then there is multiple abscess." The right lobe was most commonly affected. In only two instances was the left involved.

In the diagnosis of liver abscess, symptoms, while usually only suggestive, are often of very great value. Pain of a sharp, stabbing character in the right side, radiating upward into the right shoulder and usually localized beneath the scapula, is a common symptom. Added to this, an irregular temperature, which later tends to become hectic, and early a rapid pulse, mark the beginning of septic infection. Persistent pain over the region of the whole liver, with a point of local tenderness just below the margin of the rib in the anterior axillary line, is usually present. Local signs of abscess formation (redness and œdema, with bulging and increase in the width of the interspaces of the right side) do not generally appear until late in the course of the disease, depending upon the distance of the abscess from the surface. Great increase in the area of liver-dulness not only above and below, but partially to the left of the median line, was found in all our cases.

Involvement of the diaphragm is evidenced by persistent cough with increased pain on deep inspiration. This may be an early and most marked symptom. Extension of infection to the pleura by continuity or rupture of the abscess not infrequently occurs, causing a septic pleurisy or empyema. Involvement of the lung may thus result, and occasionally spontaneous evacuation of the abscess has occurred through rupture into a bronchus. Death, however, from a septic pneumonia is by far more common. Two of our autopsies showed this condition, and it was present in two operative cases. A localized peritonitis is present in most cases of long duration. Rigidity of the right rectus muscle, however, is usually present, even before the extension of the infection to the peritoneum, and is to be noted early.

As the case develops, great emaciation and an anæmic jaundice are apparently commensurate with the destruction of liver substance. The word anæmic is applied to this jaundice to indicate a peculiar " diluted," faded, almost dusky yellow color of the skin common in these cases. A hectic temperature, a rapid running pulse, with the early development of typhoid symptoms, are in proportion to the amount of pus

present; for there seems to be no tendency to limit absorption in abscess of the liver. Sordes soon collects on the teeth and lips, and mental hebetude develops early. The pulse, at first rapid, is now running, often being out of all proportion to the temperature. It may remain at 140 to 160, or even higher, for weeks just before death. Constipation is the rule with offensive gray-colored stools, but diarrhœa is common late in the disease. A leucocytosis is generally present, but is of little value in the diagnosis, as it is very often associated with localized peritonitis, or involvement of the mesenteric glands, in cases of chronic dysentery.

While these local and general symptoms are most suggestive, an absolute diagnosis can be made only by aspiration and the detection of pus. Fortunately, this procedure is attended with but little danger of injuring the gall-bladder or the large vessels, and with strict asepsis the operation is entirely justifiable as a means of differential diagnosis. Not an untoward complication resulted in twenty-two cases of aspiration in my own experience, although in each case multiple punctures were made before the presence of an abscess was discovered or excluded. In our cases a long needle of goodly caliber was used, so that the thickened pus might be drawn through it. A general anæsthetic was given, and the needle introduced in the midaxillary line in the eighth interspace and passed in five or six different directions to its full extent. If this failed to detect pus, additional punctures were made both in the right and left lobes, for very often a liver abscess may not be detected by the ordinary puncture in the eighth interspace. This condition was present in one of our cases; and it was not until additional punctures had been made near the median line below the ribs that an abscess was discovered in the left lobe.

In order to determine the extent of liver accessible to aspiration from this point, the writer made post-mortem a series of liver punctures with long needles. The needles were left *in situ* and dissection carried down through the liver substance, when it was found that not one-half of the organ was

accessible from the eighth interspace. In one case an echino-
coccic cyst the size of a small orange lay in the posterior infe-
rior portion of the right lobe towards the median line, and
entirely escaped detection.

From these facts we were led to the conclusion that addi-
tional punctures other than in the eighth interspace must be
made before an abscess of the liver can be excluded in the
diagnosis.

The presence of pus once established, operation is im-
perative. Personally, I have operated on six cases. Four of
these were multiple abscess in which nearly the whole liver
substance was destroyed; two were large single abscesses.
Recovery resulted in but two cases,—one a large single abscess,
the other a double abscess, in which the diagnosis was fortu-
nately made comparatively early.

The reason for the high mortality after operation for liver
abscess lies chiefly in the fact that so great an amount of liver
substance is already destroyed, or the resulting septicæmia is
of so pernicious a type that the vitality of the patient is com-
pletely exhausted before he is seen by the surgeon.

Hence early diagnosis and operation are particularly im-
portant in this disease. It is just in these early cases, too, that
symptoms are vague. There may be no redness, swelling, or
local tenderness, and the only symptom suggestive of liver ab-
scess is often vague pain referred indefinitely to the region of
the liver and the constitutional symptoms of pus absorption.
It is in these cases that resort should be had at once to aspira-
tion. We have shown that this procedure is attended with a
minimum amount of risk, is efficient, and hence justifiable.

Often the local and general symptoms of abscess may de-
velop from a patch of necrosis without the formation of pus.
In these cases it is evident aspiration would fail to detect the
infected area in the early course of the disease. Two cases
came to autopsy from dysentery, and the abscesses would have
undoubtedly developed had life been prolonged. Hence, if the
symptoms persist, resort should again be had to aspiration

after a period of from ten to fourteen days. In two of our own cases pus was detected at a second trial.

To recapitulate, a patient with a distinct history of dysentery in the past two years, who has had irregular attacks of pain over the region of an enlarged liver, and these attacks have been attended with an irregular temperature, prostration. and symptoms of mal-digestion, such a patient should at once be aspirated, even if there are no local signs of pus; if the symptoms persist after an interval of two weeks, the procedure should be repeated. This course will surely result in the early detection of many liver abscesses, and their prompt operation will save many lives.

In reference to the surgical technique, if there is evidence of pointing, the abscess should, of course, be opened at that place where fluctuation is manifest. This will usually be along the costal margin, external to the rectus muscle, or in the median line, just below the ensiform cartilage. However, in the vast majority of cases, even late in the course of the disease, there are no local signs of pus that will aid the surgeon in the selection of the site for operation. In these cases, if the liver is greatly enlarged and extends much below the border of the ribs, incision may be made transversely about one inch below and parallel to the costal border. The location of the abscess as indicated by the aspirating needle will, of course, influence his decision. But in by far the greater number of cases it is best to excise a portion of a rib and drain from the side, as there is thus less danger of infection and greater facility in gaining access to the abscess cavity. Even in most extensive liver abscesses the lower anterior border of the liver is often not involved, the infectious process being confined to the substance of the organ. In many instances the abscess can be reached only with the greatest difficulty by the incision below the costal margin. By excising a portion of the eighth or ninth rib in the midaxillary line there is almost no danger of infection, but little shock, and the freest possible drainage in the most dependent position.

The aspirating needle, when once it has encountered the

abscess cavity, should not be removed, but left *in situ,* as it is a most valuable guide, and, controlled by an assistant, interferes but little with the operation. Along this may be passed a grooved director, closed hæmostat, or other blunt instrument or the finger, and the abscess thus opened. The writer much prefers the finger, as the abscess cavity can thus be partially explored at least, and additional patches of necrosis often detected.

On account of free hæmorrhage in opening a deep-seated abscess the thermocautery may be used, but this is rarely necessary. Severe hæmorrhage, if it occurs, can be controlled by packing. Usually, it is best simply to drain the abscess at operation and to use no irrigation for forty-eight hours, owing to the weakened condition of the patient and the danger of infecting the pleura or peritoneum. If the liver is adherent and the peritoneum or pleura thus protected by adhesions, the abscess may be opened at once. If no adhesions exist, and there is danger of infecting either, a delay of forty-eight hours is obviously wise. The instruction to " stitch the capsule of the liver to the margin of the wound" is more didactic than practical. Rarely, if ever, can this be done, as the liver capsule, particularly that of an inflamed liver, is so friable that no stitches will hold, and but little protection would be afforded if they did. Simply packing the wound with iodoform gauze and waiting forty-eight hours will in most cases accomplish the desired result.

While this procedure will usually operate favorably in incisions along the costal margin, it may signally fail as a means of protecting the pleura, particularly if a large effusion exists. Here Binnie's suggestion to stitch the diaphragm, with its attached liver, to the parietal pleura may be tried. Two or three stitches supported by a gauze pack may be of service. If this should fail to completely wall off the pleural cavity, the infected pleura and liver abscess should each be drained separately. This was necessary in one of our cases, that of a double liver abscess and empyema, which recovered.

Gauze will not drain liver pus. Large, preferably double

drainage tubes of non-collapsible rubber should be used. Normal salt solution, sterile water, or weak antiseptic solutions are best for irrigation, as absorption is very great and strong antiseptics are dangerous. Under daily irrigations with such solutions the discharge will completely disappear in a surprisingly short time, a week or ten days even for a large abscess. Free stimulation and most nourishing foods are particularly essential in the after-treatment.

There are few sequelæ to tropical abscess of the liver. Pleurisy is the most common, while nephritis may rarely occur. Fortunately, if a diagnosis can be made and the operation undertaken early, recovery is rapid and complete, and the chance of untoward after-effects is small. A list of the operated cases is appended.

CASE I.—*Double Abscess with Empyema; Operation; Recovery.*—Major H. R. A., Artillery Corps, United States Army; fifty-eight years old; thirty-seven years' service. Tropical service, Cuba and Porto Rico, 1898.

Family and past history have no bearing on the case, with the possible exception of an attack of typhoid fever in 1890 and a history of occasional attacks of malarial fever since that date.

In Cuba, in 1898, contracted a rather severe case of dysentery, which lasted some months, and was accompanied with marked emaciation and anæmia. Amœba found in great numbers. Recovery from this attack was apparently complete, but after about one year there was a recurrence, which lasted for more than a month. Since this attack of dysentery, his medical history shows six admissions to sick report with diagnosis relating to gastro-intestinal trouble.

Present illness dates (October 29, 1902) fully two years after his service in the tropics. It began with general malaise, headache, loss of appetite, and nausea, apparently made worse by eating. There was early slight cough. There was no redness, swelling, or œdema, and the liver, while slightly tender to deep percussion, showed very little, if any, enlargement. The right rectus muscle, however, was quite rigid; deep breathing was impossible on account of the pleuritic pain, and severe pain referred to region of right scapula (and shoulder). General

condition at this time was good; examination of skin, mucous membranes, and chest negative; abdomen seemed somewhat distended, but no rigidity. Bowels regular. Stools normal. Urine negative. Blood count gave slight leucocytosis. Pulse regular and of good quality. Temperature normal.

These symptoms continued with varying severity up to November 1, when he developed characteristic pain of pleurisy in right chest, but on examination, November 3, was negative. Temperature varied between 98° and 100° F. Examination showed effusion in right chest to a point somewhat above angle of scapula.

Diagnosis. — Liver Abscess and Pleurisy by Extension. — In order to clear up the diagnosis and locate the liver abscess, if possible, patient was placed under the influence of ether, November 6, at 6 P.M. A systematic search was made with a long aspirating needle through the eighth interspace in the mid-axillary line, thrusting the needle in several directions through one skin puncture. Not until the ninth trial was pus finally located. This was of a yellow color, but slightly tinged with red, and was found upward and backward, evidently in the dome of the right lobe of the liver. The pleural effusion was evident. An incision (four inches long) was made in the midaxillary line and one and one-half inches of the eighth rib excised. The pleura was found full of a seropurulent fluid. As there were no adhesions between the diaphragm and the parietal pleura, the operation was stopped at this stage and wound packed with iodoform gauze. By this means it was hoped to secure adhesions which would make the opening of the liver abscess at a later stage comparatively safe. Patient reacted well.

November 8, fifty-six hours later, ether was again given and the gauze packing removed. In doing this, a large amount of serous fluid was evacuated from the pleura and the very imperfect adhesions of necessity broken down. It was thus seen at once that opening the liver abscess through the present wound was out of the question, and it was decided to attempt to drain the abscess through a lower opening. The upper wound was packed and protected with gauze and one inch of the tenth rib excised; with a blunt instrument and the finger the abscess was opened about two and a half to three inches from the liver surface. Hæmorrhage was at first rather severe but not alarm-

ing. Only a small amount of pus and broken-down liver tissue was at first evacuated. But when the finger was thrust upward and backward, the main abscess was opened. It was thus seen that two distinct abscesses existed. The first and most recent was really a necrotic spot in the liver substance and contained about two drachms of pus. The second or main abscess, as nearly as could be determined, was about the size of an orange, and lay in the upper and back part of the right lobe. A large-sized drainage tube was placed in the lower wound. The wound in the pleura was packed and drained temporarily, simply by gauze. This was replaced after forty-eight hours, also, by a large rubber tube.

Patient suffered considerable shock, and required infusion of several pints of salt solution and the limit of stimulation. For the first three days his pulse varied between 120 and 134, with a temperature varying from 100° to 102° F. Both steadily improved, and he made an uneventful recovery. Both wounds drained well. On the fourteenth day the lower tube was removed. The upper pleural wound was drained until December 10, when the wound was allowed to heal. Two months after operation patient had gained twenty pounds, and was sent South for the remnant of the winter. April 10 he had entirely recovered without a sign of recurrence.

CASE II.—April 20, 1900, Private T. S., Company F, Forty-second United States Volunteers, was seen. He had never been sick since childhood until six weeks before, when he was attacked with diarrhœa. The symptoms of dysentery rapidly developed, and on his admission, April 25, he was passing from five to twelve bloody mucous stools a day. His temperature was 101° F.; tongue dry, brown, and cracked; pulse 140 and thready. The spleen was slightly enlarged, and the abdomen tympanitic and tender on pressure. A point of great tenderness was evident just below the ribs over the region of the gall-bladder. The liver extended from the fourth interspace to the level of the umbilicus, one and a half inches below the costal margin in the right mammillary line, and about three inches to the left of the left median line. He was in a condition of mental hebetude, and complained of little pain except at bowel movements. The blood count revealed a leucocytosis of 18,000. Widal's reaction was negative and the plasmodium malariæ was not found. Under

ether, an aspirating needle was inserted through the eighth interspace and pus was found on the first puncture. An incision one and a half inches long was made over the eighth rib, one inch of the rib excised, and the abscess at once opened and drained. More than one pint of fetid liver pus escaped. The abscess cavity was not irrigated until the second day, and then daily irrigations of sterile water were begun. The pus had completely disappeared on the tenth day and the man was out of bed. Recovery was complete. Amœbæ were found in the abscess cavity.

CASE III.—Sergeant J. D., Troop E, Eleventh Cavalry, for many months had had chronic dysentery. On admission, November 21, 1899, he was having from four to ten stools daily; his temperature was hectic, 99° to 102° F.; pulse, 138 and weak, and he was very weak and greatly emaciated. For several weeks he had had marked tenderness over the region of the gall-bladder; this had greatly increased. Intermittent hiccough and a persistent dry cough were troublesome, and suggested involvement of the diaphragm. The liver extended an inch below the costal margin in the nipple line, and there was marked bulging at this point and marked œdema of the whole right side.

No aspiration was made in this case, as pus was evident,— either an abscess or a suppurating gall-bladder. An incision was made one inch below the ribs in the nipple line down to the peritoneum. This was found adherent, and so the abscess, very large, "big as your head," was at once evacuated. The cavity was irrigated with normal salt solution and three large drainage tubes inserted. The pulse was so weak during operation that three pints of normal salt solution were given intravenously and one pint by hypodermoclysis. Despite this and the freest stimulation, the patient steadily grew worse, and died five days later. The autopsy showed multiple amœbic abscesses, which had destroyed nearly the whole liver substance.

CASE IV.—Private W. H. H., Company K, Thirteenth United States Infantry, had never been ill a day until August 4, 1899, when he developed a severe case of acute dysentery. From the onset his temperature was unusually high,—103° to 105° F. The discharges were of the characteristic mucus and blood, and so frequent that he was constantly on the bedpan,—more than forty movements in twenty-four hours. Almost from the first he complained of pain over the region of the liver. The organ

rapidly enlarged, and by the twelfth day the whole right side was oedematous. Aspiration revealed the presence of pus, and incision was made in the midaxillary line, excising a portion of the eighth rib. Only a small amount of pus was evacuated. The patient never rallied from the operation, and died on the thirteenth day. The autopsy showed one small abscess with several necrotic patches throughout the substance of the organ, which would undoubtedly have formed additional abscesses had the patient lived.

CASE V. — Private C. F. B., Company I, Fourth United States Infantry, gave a history of chronic dysentery of several months' standing, but on the date of admission considered himself cured of that disease. His present illness began so insidiously that he could not state the time of its onset. During the preceding month he had lost greatly in weight and suffered from a constant steady pain in the epigastrium. On admission, the temperature was subnormal and his pulse rapid and feeble, with a dry, brown tongue and mental hebetude, and his skin a dusky, jaundiced color. The liver was much enlarged, extending fully three inches to the left of the median line and one and a half inches below the ribs. Aspiration at the eighth interspace, in five or six directions, failed to detect pus, so the needle was introduced into the left lobe from a point just to the right of the median line, half an inch below the costal margin. Here puncture was successful and an incision was made down to the liver. The capsule and parietal peritoneum were adherent and a large abscess was opened and drained, with no irrigation. The patient rallied from the operation, but died on the fifth day. The autopsy revealed a large single abscess occupying the whole left lobe. It had perforated the diaphragm, and opening up the pleura had set up a septic pneumonia. Healed amoebic ulcers were found in the intestines, but the amoeba coli could not be distinguished.

CASE VI.—G. M. W., a clerk, was seen March 7, 1900. There was no history of dysentery or diarrhœa. The patient had been in the Orient five months, and in fair health until about four weeks before, when he rapidly lost weight without assignable cause. On admission to the hospital, March 7, he was much emaciated and of a peculiar dusky, jaundiced color. His temperature was subnormal and his pulse rapid and feeble. Pain

over the liver was constant, with the point of greatest tenderness one inch below the costal margin in the mammillary line. The organ was very much enlarged, extending four finger-breadths below the ribs. Under ether the aspirating needle revealed pus. An incision two and a half inches long was made below the costal border in the right nipple line. The liver was found adherent to the parietal peritoneum. On attempting to open the abscess, such free hæmorrhage occurred that the wound was packed with iodoform gauze and partially closed with silkworm-gut sutures. Further operative procedure was delayed forty-eight hours, when it was intended to open the abscess with the Paquelin cautery. However, on separating the capsule from the diaphragm, about one pint of pus was evacuated. A drainage of double tubing was instituted, and the patient left the table in a very weak condition, and died forty-eight hours later. The autopsy showed multiple abscesses of the liver involving nearly its whole structure. They varied in size from one to five inches in diameter and contained peculiarly fetid pus. There was no previous history or evidence of dysentery, nor could the amœba be found. Apparently, the case was one of multiple liver abscess following general hepatitis. The mesenteric glands were much enlarged and the spleen was septic.

INTESTINAL LOCALIZATION.[1]

A STUDY ON THE CADAVER FOR THE PURPOSE OF DETERMINING TO WHAT EXTENT
THE VARIOUS PARTS OF THE SMALL INTESTINE MAY BE IDENTIFIED
THROUGH AN ABDOMINAL WOUND.

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IT has always seemed somewhat strange to me that so little has been done in the way of a systematic study of the characteristics of the different parts of the small intestine and its mesentery for the purpose of assisting the surgeon to determine, when a loop of small intestine appears in an abdominal wound, what the approximate *position* of that loop is in reference to the rest of the intestine, and, incidentally, what the *direction* of the tube is in the loop,—that is to say, which end will lead to the duodenum and which to the ileocæcal valve.

It is, of course, true that in most abdominal operations such information concerning the position and direction of any loop of small intestine would be of no real service to the surgeon. He has no concern about the intestine except to get it out of the way by retracting or by gauze packing, which he naturally proceeds at once to do. In other cases, and especially in those where the intestine itself is to be the object of investigation or operative attack,—as, for instance, in cases of obstruction from any cause, or in connection with supposed perforation (pathological or traumatic), in anastomosis operations, in enterostomy where a fistula is to be made, or in cases where the intestine itself is taken as a guide to one end or the other,—any information of this kind, if it can be readily obtained without additional danger to the patient, must often be of great value.

[1] Read, in abstract, at the meeting of the American Surgical Association in Washington, May 14, 1903.

To be sure, all surgeons are familiar, in a sort of general way, with the characteristics of the upper and the lower parts of the bowel, and also know that in an incision in the upper part of the abdomen the upper part of the bowel is most likely to be met with, and in an incision in the lower part of the abdomen the lower part of the bowel. And yet it has seemed to me that a further study of the characteristics of the bowel and its mesentery at different points might enable the surgeon to localize an intestinal loop with more precision than formerly, and, at the same time, to determine which end is really the upper end of the loop and which the lower.

I have, therefore, during the past six months made a number of investigations on the dead body, with the idea of determining whether there were any points which would be of real assistance in this matter. I have tried to conduct these examinations on autopsied subjects, so far as conditions would allow, so that the tissues might be as nearly fresh and normal as possible. I have also used a number of cadavers in the dissecting-room at the Harvard Medical School. (I wish to acknowledge the kindness of Dr. Mallory, of the Boston City Hospital, and of Drs. Dwight and C. B. Porter, at the Harvard Medical School, who, for the purpose of these investigations, placed a large amount of material at my disposal.)

In some of the cadavers I examined the intestine and mesentery only for the purpose of familiarizing myself with their different parts, making careful note of such points as I thought might be of use in the matter of intestinal localization. I wished not only to verify for myself the general description of the parts as given in the books, but also to get any further information which a special study of them on the cadaver might furnish. I then tested the value of all the information thus acquired through various abdominal incisions in other cadavers. The number of cadavers used for both these purposes was about forty. In all this work thin rubber gloves were worn, not only for the sake of protecting the hands, but also for the purpose of simulating, so far as the sense of touch was concerned, actual operative conditions.

(A) ACTUAL TESTS IN LOCALIZATION OF LOOPS OF INTESTINE.

At first I did most of this work alone, but later was assisted by Mr. Everett Lee, a fourth-year student at the Harvard Medical School, who made a number of useful suggestions in the course of the work.

Tests were made through various abdominal incisions on sixteen different cadavers. Through each wound a loop of intestine was pulled out, and its characteristics noted. It was then localized by means of these characteristics, the direction determined, a tag attached bearing a number, after which it was dropped back again into the abdominal cavity. Another loop was pulled through the wound, and the same process repeated. Sometimes a number of loops, one after the other, were pulled through one incision, and at other times several incisions were made and a different loop pulled through each of them, each loop being, in every case, localized and tagged before it was dropped back into the abdominal cavity and before another loop was pulled out. A written record was kept of the estimated position of each numbered loop,— that is to say, its supposed distance from the upper or lower end of the intestine. Later the abdominal cavity was laid open, from ensiform cartilage to symphysis pubis, and the measure, starting from the end of the duodenum. The actual distances of the different tags from that point were recorded as soon as they were determined. The direction of the gut was indicated at different points by special pins, the ends of which were supposed to point, in the opinion of the examiner, to the ileocæcal valve.

I have on record 180 different localizations. These represent, however, about 125 different loops, as Mr. Lee and myself frequently localized the same loop independently of each other, such localizations on the same loop being recorded as two. The results of these 180 localization tests are given in the following table:

NUMBER.

Localizations, correct .... 7 (about 4 per cent.)
Localizations, with error of less than 1 foot 46 (" 25 ")
Localizations, with error of 1 foot or more,
    but less than 2 feet................... 38 (" 21 ")
Localizations, with error of 2 feet or more,
    but less than 3 feet................... 45 (" 25 ")
Localizations, with error of 3 feet or more,
    but less than 4 feet................... 16 (" 8 ")
Localizations, with error of 4 feet or more,
    but less than 5 feet................... 15 (" 8 ")
Localizations, with error of 5 feet or more,
    but less than 6 feet................... 7 (" 4 ")
Localizations, with error of 6 feet or more,
    but less than 7 feet................... 5 (" 3 ")
Localizations, with still greater error .... 1 (" 0.5 ")

Total number of localization tests.. 180
The average error in the 180 tests was 2.03 + feet.

Seventy-five per cent. of all the localizations were, therefore, made with errors of less than three feet. In the early stages of this study, before all the determining factors could be made use of, the errors were more marked than later, when the tests showed a distinct improvement in this respect.

The following record is given as a sample of localization. The cadaver was that of a well-developed man, about fifty years of age. An incision was made in the median line, between the umbilicus and pubes. The hand was introduced into the abdominal cavity, and ten different loops from ten different regions pulled through the wound one after the other, each one, however, being localized (as to its distance from the end of the duodenum), tagged, and returned into the cavity before another one was drawn out.

Loop.	Localization.		Actual Site.			Errors.		
1	6 feet		3 feet	10 inches		2 feet	2 inches	
2	18 "		22 "	6 "		4 "	6 "	
3	10 "		8 "	9 "		1 "	3 "	
4	14 "		14 "	3 "			3 "	
5	16 "		12 "	1 "		3 "	11 "	
6	17 "		20 "	4 "		3 "	4 "	
7	8 "		7 "	4 "			8 "	
8	3 "			10 "		2 "	2 "	
9	18 "		18 "	5 "			5 "	
10	4 "		3 "	2 "			10 "	

Total errors .... 19 feet 6 inches
Average error (about) .... 2 "
Estimated length of intestine .... 21 "
Actual length of intestine .... 22 " 9 "

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I could give records showing much closer estimates and others showing much worse. On the whole, this record is about an average one.

In this cadaver work I used mostly actual measurements from one end or the other for the sake of greater accuracy in localization and for the purpose of comparing results. One may use equally well, proportions such as " thirds," " quarters," or " fifths." Thus, one may say that such and such a loop occupies the upper or lower part of the upper, middle, or lower third, or that it is about so and so far from one end or the other, or from the middle point of the gut. Obviously, any method may be used in indicating the site of a given loop, provided it is sufficiently accurate for the purpose in hand.

It will, perhaps, appear strange that I have, thus far at least, made no mention of the terms " jejunum" and " ileum." My reason for this is that, as we all know, there is no dividing line between them. In fact, although the jejunum is usually described in the text-books (*e.g.*, Quain) as being the upper two-fifths and the ileum the lower three-fifths, some German anatomists (*e.g.*, Merkel) speak of the upper three-fifths as jejunum and the lower two-fifths as ileum. The middle one-fifth is, therefore, jejunum or ileum, according to the anatomical authority one prefers to follow. These terms, however, are so firmly rooted that they will probably always be used by surgeons; but they can never mean anything more than to convey a very general idea as to position, for the term " jejunum" merely means the upper part of the bowel, and the term " ileum" the lower part of it.

(B) ACTUAL TESTS IN THE DETERMINATION OF DIRECTION IN GIVEN LOOPS OF INTESTINE.

The attempt to determine the direction of the gut was made in ninety different loops in fifteen different cadavers. In eight the direction proved to be wrong; in eighty-two (or 91 per cent.) it was right.

(C) CHARACTERISTICS (ANATOMICAL AND OTHERWISE) OF THE SMALL INTESTINE, WHICH MAY BE USED ON THE CADAVER FOR DETERMINING THE POSITION AND DIRECTION OF ANY GIVEN LOOP OF INTESTINE.

I may as well state here my regret that I have been able to find no infallible characteristic sign to indicate any one particular point of the bowel, except at the two ends where the bowel is fixed.

Almost all the characteristics of the different parts of the intestine undergo changes as we pass to other parts of it, and even these transitions vary with the individual. The changes are usually gradual, and not abrupt, and for this reason we cannot say that a change takes place at such and such a point. This makes localization difficult enough; but when we realize that a bowel (I refer only to that part of it which has a mesentery, *i.e.*, from the end of the duodenum down) may be anywhere from fifteen feet to thirty feet in length, and that, before our incision, we have no means whatever of knowing what this length will be, our problem becomes enormously complicated. And yet, when we have so many things to help us,—even if none of them are positively distinctive,—we may be able to localize a loop near enough for practical purposes by a combination of them. A knowledge of these various combinations means, of course, a certain amount of practice and experience, though not so much as one would suppose.

1. *What Part of the Small Intestine may We expect to meet in Any One of the Various Abdominal Incisions?*—This naturally brings up the subject of the disposition of the intestine in the various regions of the abdominal cavity. The studies of Treves,[1] Henke,[2] Sernoff,[3] Weinberg,[4] and Mall[5] are exhaustive and valuable from an anatomical stand-point, but in the way of assisting the surgeon in practical work they have not very much to offer. Generally speaking, however, it is well to bear in mind that Mall, in a systematic examination of the arrangement of the mesenteric loops in forty-one cadavers, found what he called a normal arrangement in

twenty-one of them.   By consulting his diagram, it will be
seen that in this normal arrangement the principal sweeps of
the mesentery are first to the left, then to the right, then to
the left iliac region, and, finally, into the pelvis and up again to
the ileocæcal valve.   There are, however, many variations from
this normal standard.   When one realizes the extreme mobility
of the small intestines, one is not surprised to see with what
ease they may be pushed to any part of the abdomen, and to
this fact, more, perhaps, than to any other, is to be attributed
the different positions in which the same coils are found in dif-
ferent cadavers.   While the different coils may have in the
same body their favorite places of rest, it is evident that they
are easily changed by change of posture of the individual or as
a result of pressure applied from one direction or another.
Tumors may push the intestines to any part of the abdominal
cavity.   An enlarged stomach may push them all into the
pelvis, and an enlarged colon may press them to one side or
the other.   In one cadaver with ascites I found, as one would
expect, that there were no coils at the back of the abdominal
cavity or in the pelvis.   Dr. Mixter tells me of a case of his in
which, on opening the abdominal cavity, he found that most
of the small intestine had passed upward into the pleural cavity
through a rent in the diaphragm.   I have noticed in a few
cadavers, where there was great emaciation and where the
abdominal wall was represented by a concavity instead of a
convexity, that most of the small intestines were in the pelvis.

As I shall, from time to time, refer to the root of the
mesentery for various points in this paper, and as its position
has something to do with the arrangement of the various intes-
tinal loops, I insert here a brief description of it.

The mesentery springs from the posterior wall of the ab-
domen along a straight line six inches in length, which starts
above on the left side of the spinal column at the point where
the duodenum ends, about on a level with the body of the second
lumbar vertebra, and is continued obliquely downward and to
the right, to end in an indefinite way at a point about opposite
the sacro-iliac synchondrosis.   I have been able to find no

FIG. 1.—Showing the small intestine puckered up on a rod. (Drawn from a photograph.)
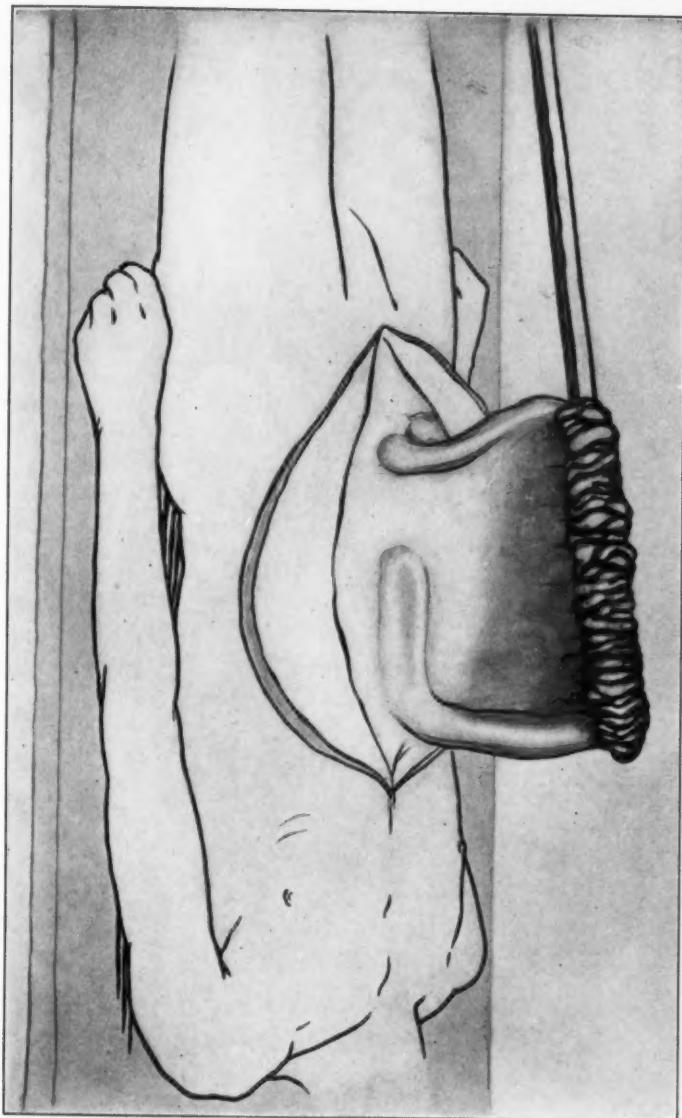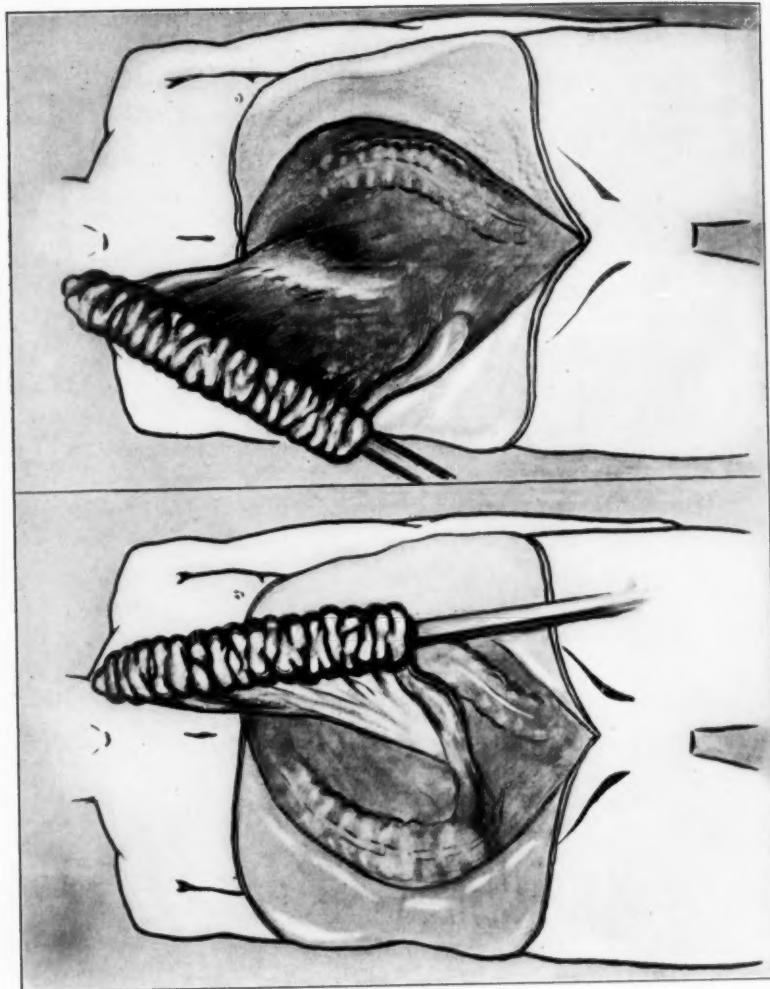
FIG. 2.—Showing the right fossa of the abdominal cavity and the oblique attachment of the mesentery. (Drawn from a photograph.)

FIG. 3.—Showing the left fossa of the abdominal cavity and the oblique attachment of the mesentery. (Drawn from a photograph.)

upper, middle, and lower thirds of the small intestine, respectively.

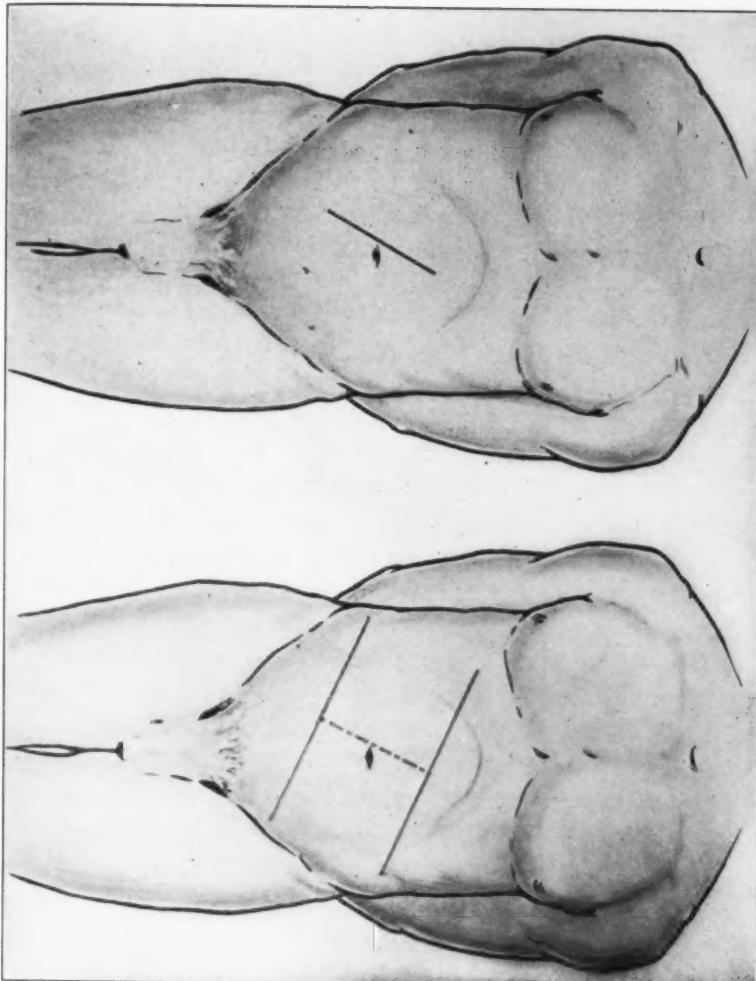Fig. 4.—Showing approximately the line of the mesenteric root as traced on the abdominal wall.

Fig. 5.—Showing the two oblique lines (black) drawn at right angles to the two extremities of the line (dotted) of the mesenteric root. The upper, middle, and lower compartments here indicated contain in most instances the upper, middle, and lower thirds of the small intestine, respectively.

(Drawn from a photograph.)

(Drawn from a photograph.)
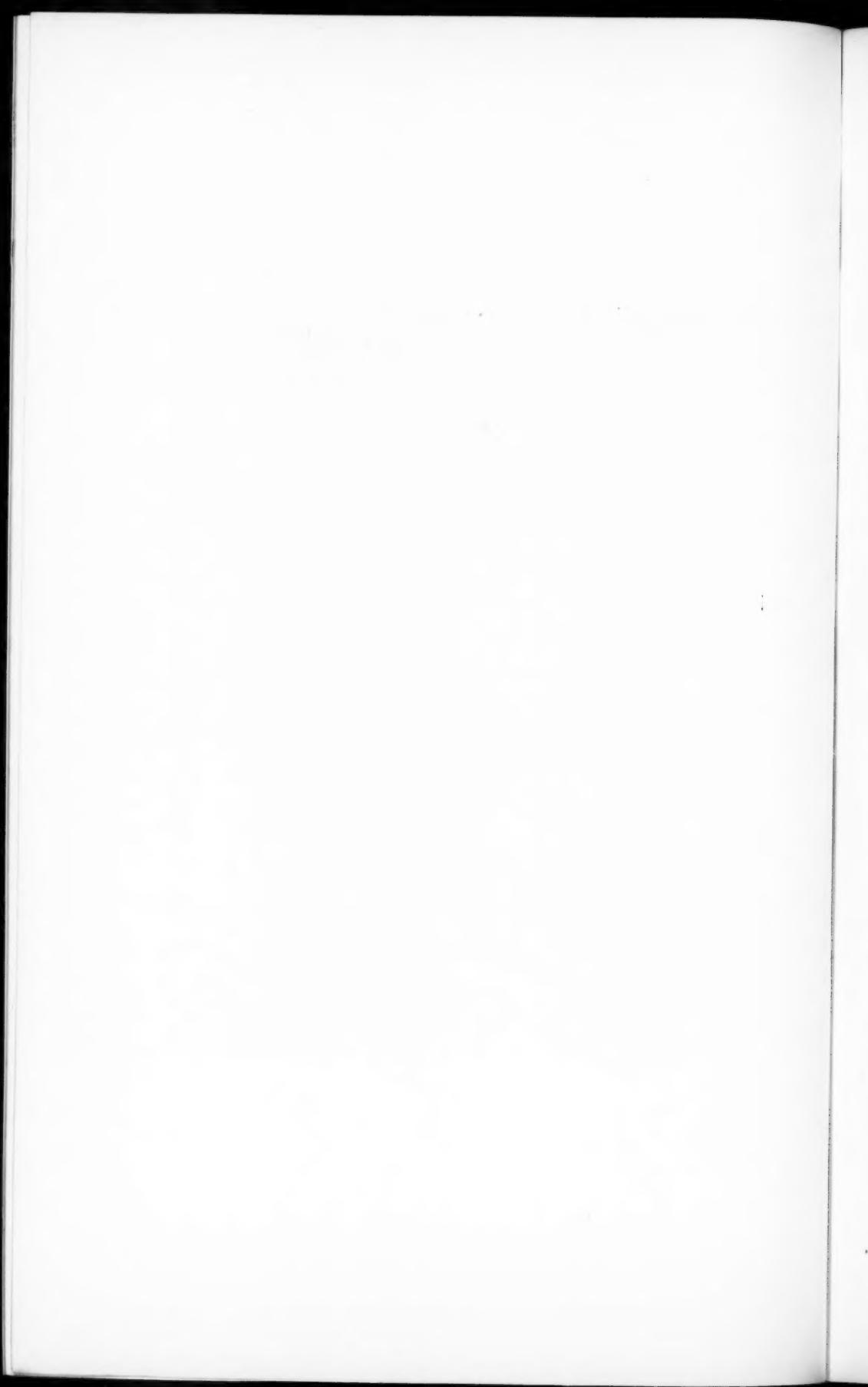
very satisfactory illustrations to demonstrate this mesenteric root, and have, therefore, devised a method of my own, which I think, for the purposes of this paper at least, will show it very satisfactorily. This method has the additional advantage of simplifying the intestinal tube by causing it to conform to a straight line (Fig. 1).

A rod has been pushed into the intestine through an opening in the gut about six to eight inches above the ileocæcal valve, and the entire intestine, barring the upper and lower few inches, is drawn over its tip and puckered up on the rod in exactly the same way that an earth-worm is put upon a hook. Two ligatures are then placed on the ends, and it is found that, without using undue force, the twenty feet of intestine, more or less, can be made to occupy a space of not more than one foot in length.* When the intestine is held up on the rod, and placed so that the axis of the rod is parallel with the axis of the oblique line of the mesenteric root, the mesentery may be inspected with great ease. Looked at in this way, the mesentery forms a sort of partition, as it were, with the puckered intestine fringing its upper edge. It thus divides the abdominal cavity into two large fossæ, of which the left is much the larger (Figs. 2 and 3).

The correspondence between the different parts of the small intestine and the oblique attachment of the mesentery is made evident here, and it becomes more obvious why the upper part of the intestine would be most apt to occupy the upper part of the abdomen and the lower part of the intestine the lower part of the abdomen.

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* It is astonishing with what ease this can be done when the abdominal cavity has been freely laid open. In fact, so readily is it accomplished under these conditions as to suggest the possibility of introducing into the gut (when freely exposed in an operation) a rigid tube for purposes of inspection of the inside of the gut or for the removal of gas or other intestinal contents. The tube cannot be pushed into the gut, but the gut must be pulled up over the end of the tube. To what extent the mechanical part of this procedure can be accomplished on the living subject through an ordinary abdominal wound may be easily determined on the cadaver. It is, of course, uncertain to what extent the shock and danger of infection, in connection with such a procedure, would prevent its use.

I have found that, in normal conditions, the upper six feet
or so of the tube is generally confined to the left hypochondriac
region, occupying a deep fossa there under the ribs, and in such
a position that its coils would not usually be encountered
through any of the ordinary abdominal incisions.   The middle
part of the intestine usually occupies the middle parts of the
abdomen, while the lower part of the tube is generally in the
pelvis and in the right iliac fossa.   In order to roughly indi-
cate on the outside of the body the positions ordinarily occu-
pied by the upper, middle, and lower thirds of the intestine,
I have found that two straight lines running obliquely across
the abdomen at the two ends of and at right angles with the
line of the mesenteric root will roughly divide the abdomen
into three regions, each of which will contain in most bodies
about one-third of the intestinal tube, the upper third being
in the first region, the middle third in the second region, and
the lower third in the third region, as shown in the diagrams.
(Figs. 4 and 5.)

It will thus be seen that an incision anywhere above the
first line will probably disclose loops belonging to (or near)
the upper third of the intestine; anywhere between the first
and second lines, loops belonging to the middle third, and any-
where below the second line, loops belonging to the lower third.
This appears to be a pretty good general rule in intestinal
topography, to assist us in determining, while making our inci-
sion, what part of the bowel we are likely to meet with first.
We should not forget, however, that there are occasional and
marked exceptions to this rule.

2. *The Length of the Intestine.*—There seems to be no
relation whatever between the length of the intestine and the
age or sex of the individual.   So far as I know, all who have
written on the subject bear witness to this.   Therefore, we
have no means of knowing, before we make our incision,
whether we are to meet a long, a short, or a medium intestine.
Treves attributes these variations to physiological influences,
and this explanation, though somewhat vague, has been pretty
generally accepted by those who have investigated the subject.

It is not at all clear why there should be such great variations in the length of the tube in different individuals. Of the subjects examined by me the shortest intestine was fifteen feet, and the longest twenty-nine feet, the average being about twenty-one feet. Almost all the measurements were made *in situ* with the aid of a tape measure.

I have recently noticed in three or four cases where the intestine was very long that the mesentery was also of unusual length, and that the vasa recta (or the little straight vessels running from the mesenteric loops to the intestine) were much longer than the average. I have also noticed in a few cases where the intestine was short that the mesentery and vasa recta were also inclined to be short. Occasionally I have been able to estimate, with some success, the approximate length of the bowel by localizing the first loop presenting, and determining—by putting the mesentery gently on the stretch and by examining the vasa recta—whether the mesentery and vasa recta were longer or shorter than the average at this part of the tube. If longer, I made an estimate that the intestine was above the average,—that is, more than twenty-one feet; and, if shorter, I considered that it was probably below the average, or less than twenty-one feet. This point I speak of, incidentally only, as a matter of general interest. But, having tried it in so few cases, I cannot say whether this test for determining the length of the intestine from the length of the mesentery and the vasa recta in any one loop is at all reliable.

The small intestine is described in the books as being thicker and of greater diameter in its upper than in its lower part. Other general characteristics of the different parts of the tube are occasionally alluded to.

The statements which I shall make in reference to the characteristics of the intestine and mesentery are based almost entirely upon the results of the examinations I have made on the cadaver. I should like to say, however, that on account of the extreme variability of the different characteristics of the intestine in different individuals, a larger experience may

later necessitate an appreciable modification of some of these statements.

3. *The Size of the Intestine.*—The diameter of the gut is greatest above, and gradually diminishes in size as we go down the tube.   When we reach the lower third or so, the size remains about the same throughout.   (The size may vary so much in life, however, with contraction or distention that, as a means of distinguishing one part of the gut from another, a knowledge of different diameters, given in actual measurements, would not be of much value.)

4. *The Thickness of the Intestine.*—The upper part of the small intestine is normally thicker than any other part.   This thickness is principally due to the presence of large and numerous valvulæ conniventes and to the great development of the muscular layers.   As we pass down the tube we observe that it gradually gets thinner and thinner until we reach the lower third of the gut, where it remains about the same, thickening up again, however, in the last two or three feet.

The thickening of the lower part of the tube is presumably due to an increase in the muscular elements, the food being at this point distinctly more solid and, therefore, more difficult to force onward.   In certain cases of chronic obstruction the thickness and size of the tube are greatly increased, as I have had occasion to observe recently in a case of obstruction due to cancer at the ileocæcal valve.   Presumably the increased thickness in such cases is largely due to hypertrophy of the muscular walls of the gut.   Great distention by gas increases the apparent size of the gut and diminishes the thickness of the walls.

5. *The Color and General Vascularity.*—The upper part of the bowel in normal conditions is bright pink or red, and exhibits great numbers of branching vessels of good size.   The color as we go down the tube gradually fades out to a gray or pinkish or yellowish gray, and the vascularity grows less and less marked.

6. *The Valvulæ Conniventes.*—In the upper part of the bowel the valvulæ conniventes are large and numerous.   They

can always be felt, and generally seen as pinkish or whitish rings, more or less complete, about the gut. They gradually diminish in number, but especially in size, as we pass down the tube, until a point is reached, which I have found to be about fourteen or fifteen feet from the end of the duodenum, beyond which they can seldom be felt or seen. Though the distance to which the valvulæ conniventes extend varies somewhat, this variation has, apparently, nothing to do with the variations in the length of the tube.

7. *Contents of Intestine.*—Mention is made of the contents of the intestine only for the sake of completeness. The different parts of the intestine show food in the various stages of intestinal digestion. The consistency increases somewhat towards the lower end of the tube.

8. *Resistance at the Two Ends of the Bowel.*—It is hardly necessary to call to mind the fact that when one end of a loop which is high up in the bowel is gently pulled upon and meets with a resistance, the loop is probably close to the duodenum; and also that, when one end of a loop low down in the bowel meets with a resistance in the ileocæcal region, the loop is probably a short distance from the valve.

9. *General Vascularity of the Mesentery near the Bowel.* —Opposite the upper part of the bowel the mesenteric vessels are distinctly larger than opposite any other part of it. These vessels grow smaller and smaller as we pass downward until the lower third of the gut is reached, where they remain about the same size as far as the ileocæcal valve. The arrangement of the mesenteric vessels has some features which intimately concern the subject in hand, and which I shall describe with some detail. Diagrammatically speaking, the main branches of the superior mesenteric artery unite with each other by means of loops, which are called for convenience " primary loops;" in some parts of the tube, " secondary loops," and even, occasionally, " tertiary loops" are superimposed upon these. From these loops little straight vessels—the vasa recta already referred to—run to the bowel, upon which they ramify,

alternating, as a rule, as to the side of the intestine which they supply. The mesenteric veins are arranged in a manner somewhat similar to the arteries.

10. *The Loops of the Mesenteric Vessels.*—Opposite the upper part of the bowel there are only primary loops. Occasionally a secondary loop appears, but it is small and insignificant as compared with the primary loops, which are large and quite regular. As we proceed down the bowel secondary loops become more numerous, larger, and approach nearer to the bowel than the primary loops in the upper part. As a rule, secondary loops become a prominent feature at about the fourth foot. As we continue further downward, the secondary loops (and, possibly, tertiary loops) become still more numerous and the primary loops smaller, the loops all the time getting nearer and nearer to the gut. Opposite the lower part of the gut the loops generally lose their characteristic appearance, and are represented by a complicated network.

11. *The Vasa Recta.*—Opposite the upper part of the intestine the vasa recta are from three to five centimetres long, when the loop of small intestine to which they run is lifted up so as to put them gently on the stretch. They are straight, large, and regular, and rarely give off branches in the mesentery. In the lower third they are very short, being generally less than one centimetre in length. Here they are less straight, smaller, less regular, and have frequent branches in the mesentery.

For the points concerning the general arrangement and variations in the loops of the mesenteric vessels and the vasa brevia in the different parts of the mesentery I am indebted to an article in the *Reports of the Meeting of the Association of American Anatomists,* 1897, by Dr. Thomas Dwight, Professor of Anatomy at Harvard. Dr. Dwight kindly called my attention to this article and also to three museum specimens prepared to illustrate these points.*

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* Dr. Dwight republished his observations in an article in the Anatom. Anzeiger, Band xxiii, 1903.

12. *The Thickness and Translucency of the Mesentery.*— Both of these conditions vary markedly in different subjects,— the more fat present, the more opaque the mesentery; the less fat, the more translucent the mesentery. The thinnest part of the mesentery is that portion which is adjacent to the upper part of the intestine. As we proceed down the gut the adjacent mesentery becomes thicker and thicker, due, apparently, to the deposition of fat and to the presence of a ligament of fibrous and plain muscular tissue which is said to aid in the support of the lower coils of intestine. Thus, in the upper part of the mesentery and intestine we have the thinnest part of the mesentery opposite the thickest part of the tube; and, farther down, the thickest part of the mesentery opposite the thinnest part of the tube.

The translucency varies enormously. In some cases the mesentery in the upper part is as transparent as a thin sheet of mica, and even in the whole course of the tube it may transmit some light. In other cases it is quite opaque, especially below, where in adipose subjects there is often so much fat that the vessels cannot be seen, or they may be represented—on the cadaver, at least—by mere depressions.

One feature, however, I have found of some value in all the cadavers examined in reference to this point. If one raises a loop from the uppermost part of the intestine, and holds it in such a position that the light will shine through the mesentery, one will notice, in that part of the mesentery close to the gut, little transparent spaces between the vasa recta. Some of these " lunettes," as I call them, are almost always present opposite the upper part of the gut even in the thickest mesenteries. I have found, as a rule, that they gradually grow smaller, become streaked with fat, and disappear at about the eighth foot. They may, however, in exceptional cases, persist to the end of the gut.

13. *Tabs of Fat close to the Mesenteric Border of the Intestine.*—If we examine that part of the mesentery adjacent to the lower third or so of the gut we will usually find, except in the thinnest subjects, little masses of fat which project from

the mesentery towards the bowel, or even extend upon it.   In one very fat subject I found these tabs present from one end of the intestine to the other.

The accompanying drawings taken from actual specimens present pictures, which, according to my experience, are fairly characteristic of the different parts of an intestine and adjacent mesentery, where the tube is about the average length, and where the vessels are not obscured by fat.   (Figs. 6–11 inclusive.)

14. *Direction of the Stretched Mesentery.*—If a loop of intestine appearing in an abdominal wound is gently drawn out of the wound in such direction as to pull away from the known line of the mesenteric attachment in the back part of the abdomen, we can often, by noting the direction of the line of resistance, get an approximate idea as to the part of the mesenteric root which resists, and this will probably give us some suggestion as to what part of the intestinal tube our loop occupies.   This test is, of course, of more value through those incisions which make it possible to pull our loop at right angles to the mesenteric root, than through incisions where we are obliged to pull obliquely.   In using this test it is sometimes worth the while to run the finger down the mesentery, along the line of resistance, towards the mesenteric root.   This line can, however, seldom be followed to the mesenteric root itself, for when traction is made upon any part of the intestinal tube the deeper parts of the mesentery apparently move as a whole, and the line of resistance in the mesentery, which is generally evident near the intestine, divides into two or more lines in the deeper parts of the mesentery.

In median-line incisions we can, by pulling the loop of intestine downward, generally determine with a good deal of certainty whether the line of resistance from above is from the median line of the body or from the left or right of it.   The more the line of resistance from below upward inclines to the left, the nearer is the loop to the duodenum; and the more it inclines to the right, the nearer it is to the ileocæcal valve.
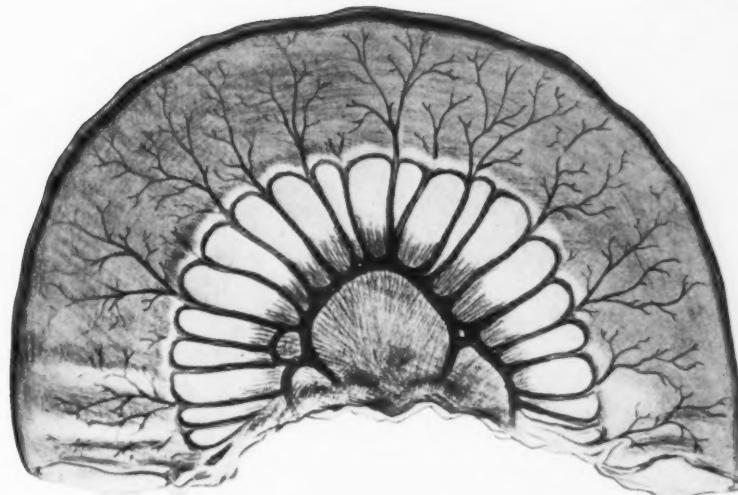
Fig. 6.—A loop of intestine, the middle of which is exactly three feet from the end of the duodenum. The gut is of large size. The mesenteric loops are primary, and the vasa recta large, long, and regular in distribution. The translucent spaces (lunettes) between the vessels are extensive. Below, the mesentery is streaked with fat. The veins, which had a distribution similar to the arteries, are for simplicity omitted from this and from the subsequent drawings. (The subject from which the specimen was taken was a male of forty years, with rather less than the usual amount of fat. The entire length of the intestine was twenty-three feet.)

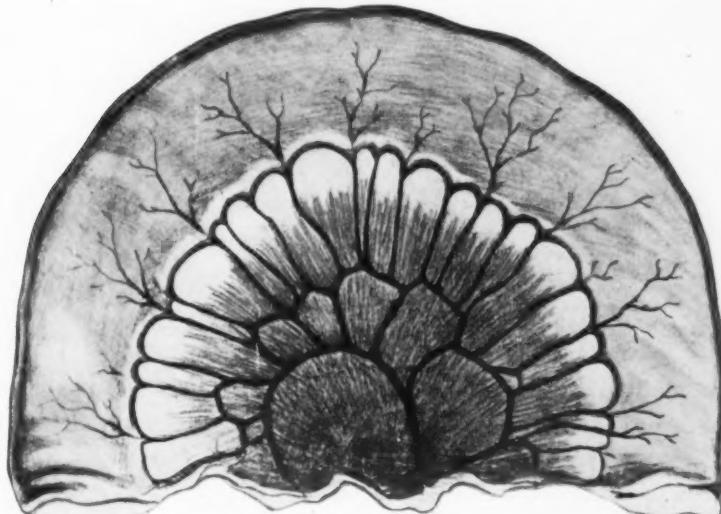Fig. 7.—A loop of intestine at six feet. As compared with Fig. 6 the gut is somewhat smaller. The vascularity of the intestine and mesentery is less. Secondary loops are a prominent feature. The vasa recta are smaller. The lunettes are also present, but are not so large as in Fig. 6. (The subject was a male of about thirty-five years, with an average amount of fat. The entire length of the intestine was twenty feet.)

FIG. 8.—A loop of intestine at nine feet. The secondary loops are large; the vasa recta are somewhat irregular and show branches. No lunettes are present, and the mesentery is streaked with fat, and is, therefore, somewhat opaque. (The specimen was taken from the same subject which furnished Fig. 6.)
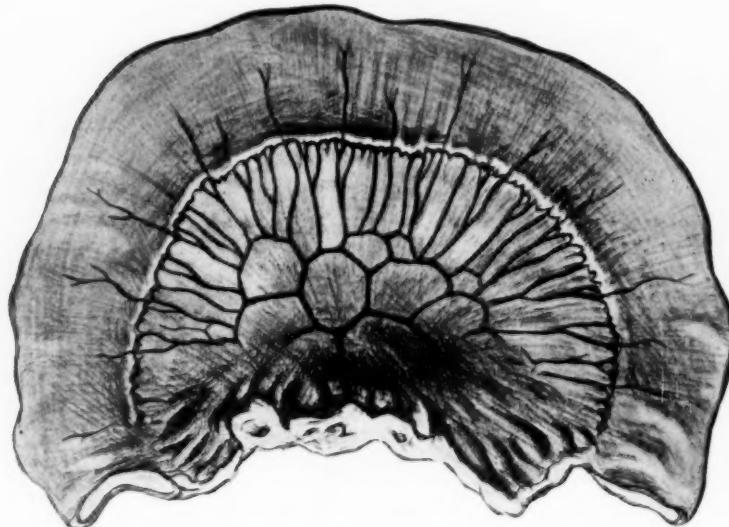

FIG. 9.—A loop of intestine at twelve feet. The vessels are smaller. The primary loops are lost in the fat, but secondary and even tertiary loops are visible. The vasa recta are shorter, more irregular, and branching. (The specimen came from the same subject which urnished Figs. 6 and 8.)
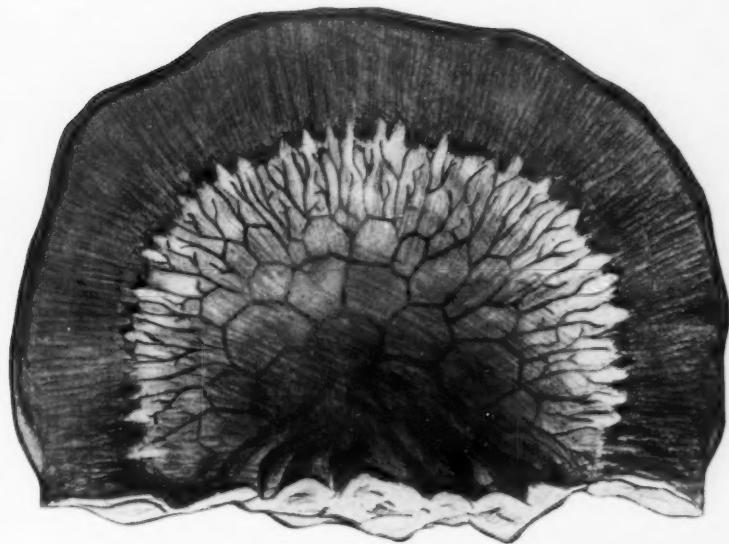
Fig. 10.—A loop of intestine at seventeen feet. The mesentery is opaque, and small tabs of fat begin to appear along the mesenteric border of the gut. The vessels are represented by a somewhat complicated net-work, and are seen with difficulty in the thick fat of the mesentery. (The specimen came from the subject which furnished Figs. 6, 8, and 9.)
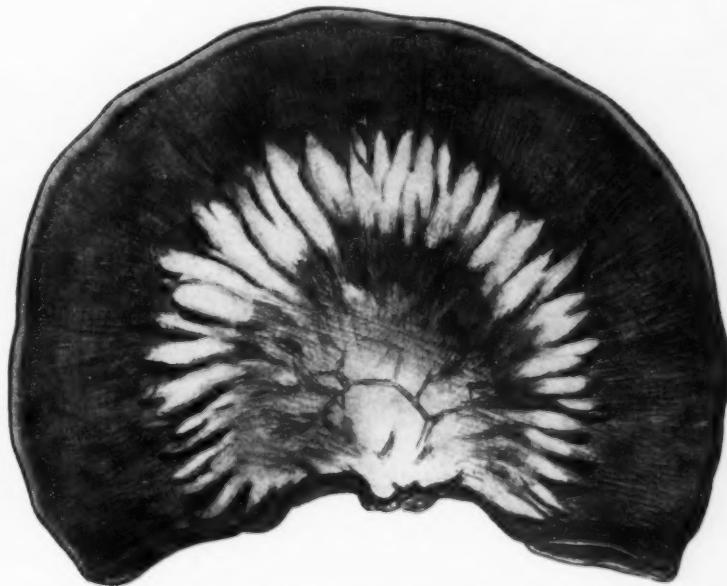
Fig. 11.—A loop of intestine at twenty feet. The gut appears to be thick and large. The mesentery is quite fat and opaque, and large and numerous fat tabs are present. The vessels, which are complicated, are seen with difficulty, and are represented by mere grooves in the fat. (The subject was a stout woman, and the entire length of the gut was twenty-one feet.)

For the purpose of summarizing the points already described for localizing an intestinal loop, the following table, showing roughly the usual characteristics of an intestine, which is twenty-one feet long (the average), is here inserted.

15. *Determination of Direction.** — In order to understand the method of examination by which the direction of any given loop of intestine may be determined, it will be necessary to revert to Figs. 1, 2, and 3, which show the intestine puckered up upon the rod and held parallel with the mesenteric root.
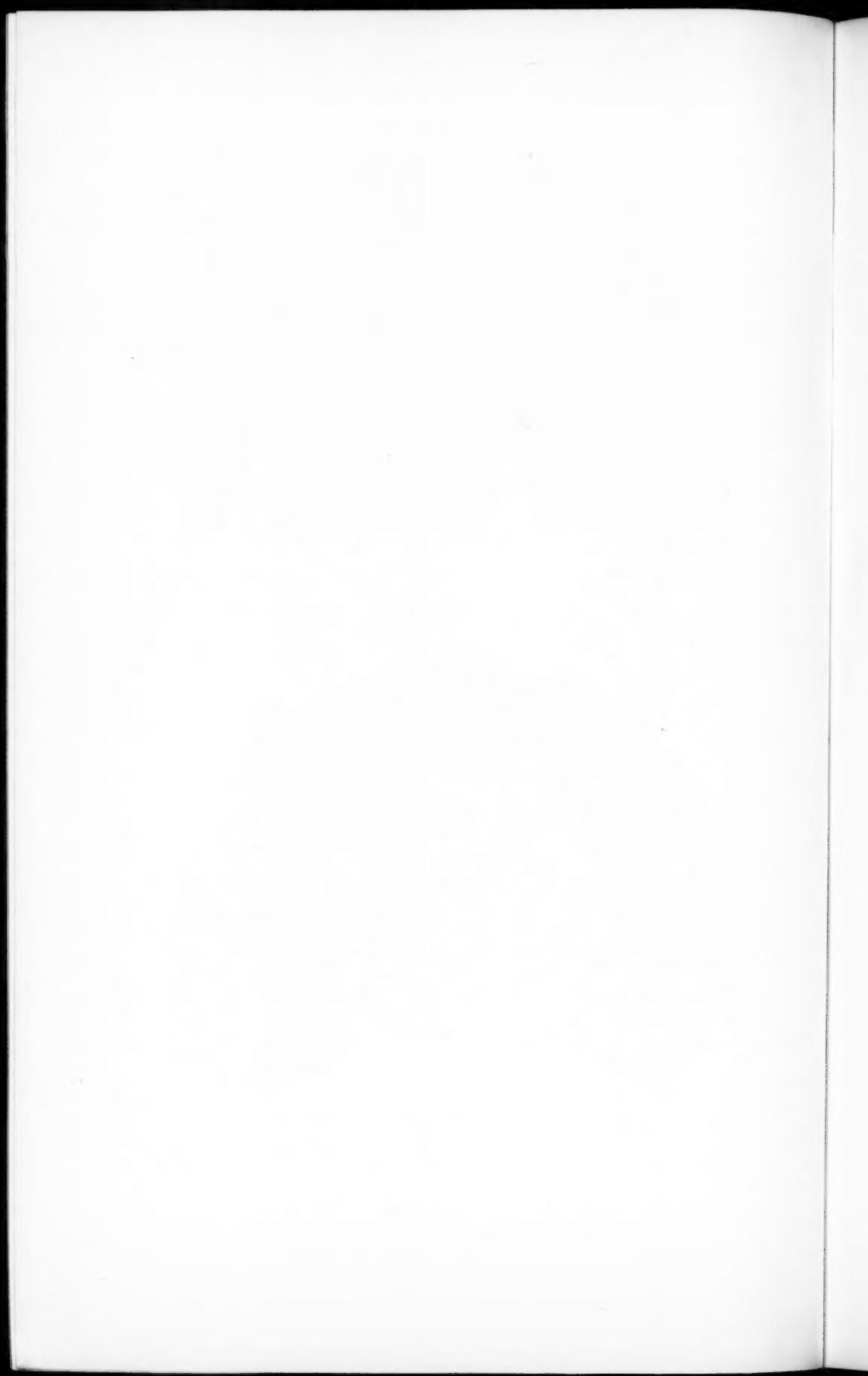
When the mesentery is followed down with the finger on the left side of the intestine the finger must enter the left fossa, and cannot get into the right fossa without first crossing over the intestine. On the other hand, if the right side of the mesentery is followed down to its root, the finger can only go into the right fossa. One side of the mesentery, therefore, leads to the left fossa only, and the other side to the right fossa only.†

The side of the intestine, therefore, corresponding with the left fossa is the left side, and the side of it corresponding with the right fossa is the right side.

Now, let us suppose that the surgeon has between his fingers a loop of bowel, and wishes to determine its direction. He knows that one side of the loop is the left side of the intestine, and that the corresponding side of the mesentery, if closely followed down to the mesenteric root, will conduct him

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* Occasionally on the living subject visible peristalsis may indicate the direction, though one can hardly be sure that the peristalsis is not reversed. It has been suggested (by Senn, I believe) to apply salt to the intestine for the purpose of stimulating the peristaltic waves, and thus ascertaining the direction.

† It is, I think, a point worth noting that in case we have to wash out the abdominal cavity, the mesentery on the two sides of any loop of small intestine will conduct the tip of the irrigating tube to the bottom of the two fossæ. We can thus at once flush out the great right and left cavities from the bottom in a manner which must certainly be an improvement over the old custom of pushing the irrigating tube aimlessly into different parts of the abdominal cavity.

into the left fossa; he also knows that the other side of the bowel is its right side, and that the mesentery on that side will conduct him into the right fossa. Now, if his finger goes into the great fossa on the left side of the abdomen, after having closely followed the mesentery down to its root and arranged his loop to be parallel with that root, he then knows that the left and right sides of the intestine face to the left and right sides of the abdomen respectively, and that the end of the loop which points downward is the end nearest the ileocæcal valve. He can determine the direction of the gut in a similar way in case his finger enters the right fossa. All this would seem very simple were it not for the twists in mesentery and intestine, which tend to mislead one. A little practice will usually enable one to recognize a twist in the mesentery. This should be untwisted by rotation of the gut, after which the direction is determined by another palpation of the mesenteric root.

It is now over a year since the possibility of thus determining the direction in any loop of bowel by reference to the root of the mesentery occurred to me. In fact, I tried it practically in a number of operations, as well as on cadavers, at the Boston City Hospital. I supposed at that time that the idea was a new one. Soon after this, however, when reading Dr. Woolsey's book on " Surgical Anatomy," I saw the point alluded to. I then wrote to Dr. Woolsey to ascertain whether it was original with him, and, if not, where the idea came from. He kindly replied at once to my letter, saying that he did not remember where he had come across it, but that he was quite sure he did not devise it himself. He also stated that he had used the method in class instruction in surgical anatomy and in operations on the living subject for several years. Since receiving Dr. Woolsey's letter I have seen the point briefly referred to in another recent work on anatomy. I think it is, however, of sufficient practical value to deserve a little more emphasis than seems to have been given to it.

There is one other method for determining the direction of a loop of bowel. This I have tried with apparent success in

TABLE SHOWING USUAL CHARACTERISTICS IN INTESTINE OF TWENTY-ONE FEET.

Usual Position in the Abdomen of the Different Thirds of the Intestine.	UPPER THIRD. Left Hypochondrium.	MIDDLE THIRD. Probably in Middle Section of Abdomen.	LOWER THIRD. Probably in Pelvis and Right Iliac Region.
	1 2 3 4 5 6 7	8 9 10 11 12 13 14	15 16 17 18 19 20 21
Intestine — Average length of intestine			
Size	Large		Small . . . . Small.
Thickness	Thick		Thin . . . . Slightly thicker.
Translucency	Opaque		Translucent . . . . Less translucent.
Vascularity	Large vessels and far apart		Small vessels and near together . . . . . .
Color	Bright pink or red		Pinkish or yellowish-gray . . . .
Valv. conn. (felt)	Large and numerous		Cannot usually be felt beyond 14th–16th foot.
Contents	Food in various stages of intestinal digestion.		Increasing consistency . . . .
Resistance at two ends of intestine.	At duodenum		. . . . At ileocæcal valve.
Mesentery — Thickness	Thin		. . . . Thick.
Translucency	Transparent or translucent		. . . . Opaque.
Lunettes	Usually to eight feet or beyond		. . . . None.
Tabs of fat	None		Usually begin at about 14th foot and become more and more prominent.
Size of vessels	Large and far apart		. . . . { Small, close together.
Vasa recta, length	Long (3–5 cm.)		. . . . Short (1 cm. or less).
Vasa recta, regularity in course and distribution.	Regular		. . . . Irregular . . . .
Vasa recta, number of branches to mesentery.	Few, if any	Often obscured by fat.	Many branches . . . . . .
Mesenteric loops	Primary. Secondary usually begin at about fourth foot.		. . . . Complicated . . . .
Part of mesenteric root indicated by stretched mesentery.	Upper part	. . . . Middle part	. . . . Lower part . . . .
Point of resistance in reference to median line.*	To left of median line	. . . . To right of median line.	. . . .

* Only of value through incisions in the median line.
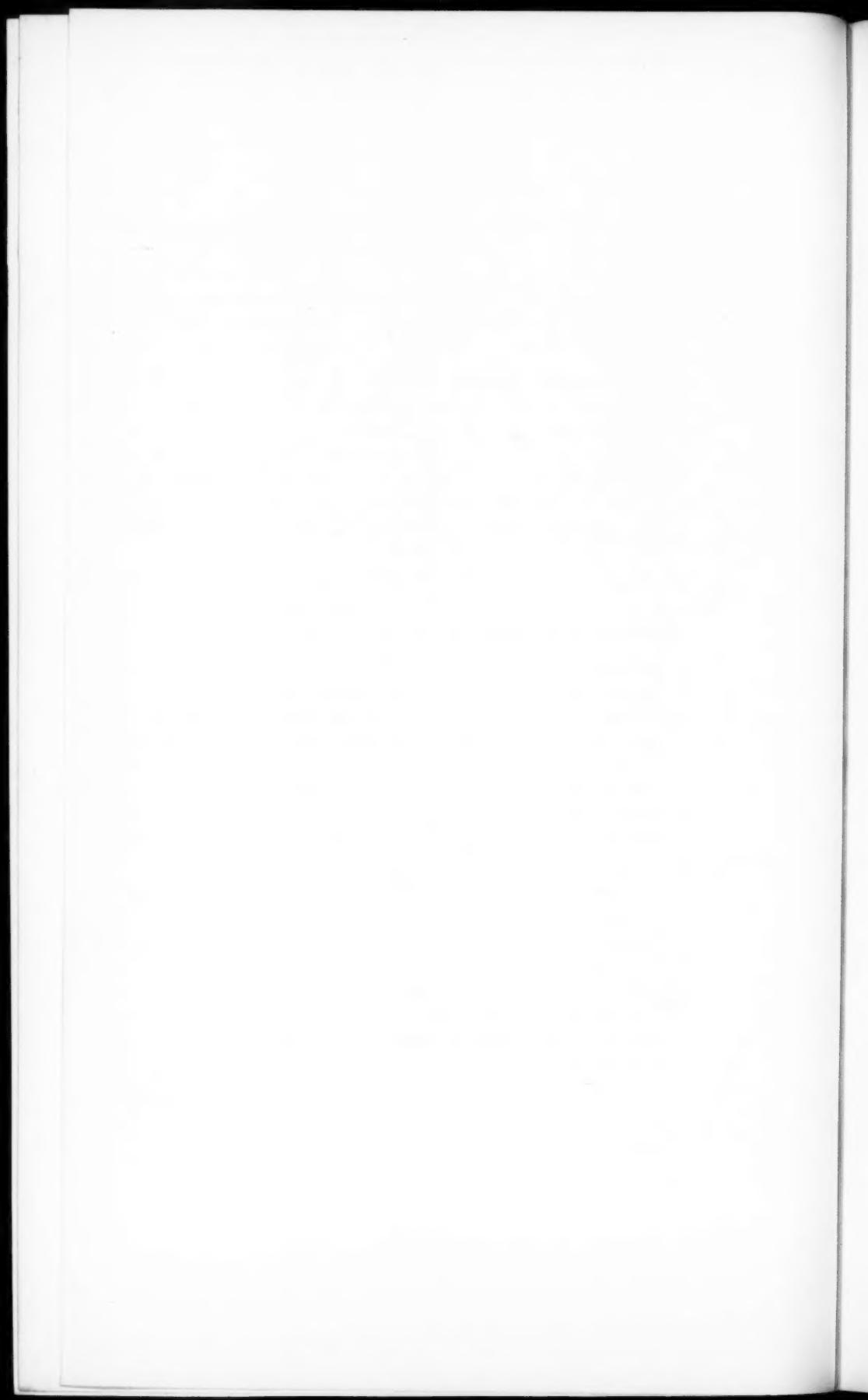
a number of cases, but have not yet given it sufficient trial to vouch for its reliability. If one takes one end of the loop between the thumb and forefinger of the right hand and the other end between the thumb and forefinger of the left hand, and places the loop so that it lies parallel with the mesenteric root, one can then, while drawing in a direction away from the mesenteric root and pulling gently first with one hand and then with the other, usually tell (if the other parts are retracted) whether the loop is twisted or not. If there is a twist, it can usually be seen in the stretched mesentery. If seen, it can be untwisted, and when one is satisfied that there is no twist, then that part of the loop which points downward is nearest to the ileocæcal valve. I have also noticed a few times that the end of the loop which proved to be the upper end seemed to pull from a higher point than that which proved to be the lower end, but of this I cannot, as yet, speak very definitely. This method has the advantage that it is not necessary to manipulate the mesenteric root in order to determine the direction of the loop.

CONCLUSIONS. — The results of the tests given would seem to justify the statement that the approximate localization of a loop of small intestine and the determination of the actual direction in that loop are quite possible—at least, on the cadaver. The conditions of the intestine in life, especially when modified by physiological changes or by extreme distention, adhesions, acute inflammatory conditions, ascites, tumors, etc., may be so different from what we find in the normal abdomen of the cadaver, that it is somewhat uncertain to what extent the methods of which I have spoken would be of use in operations on the living subject. It is quite obvious, also, that, in certain cases where there is danger of spreading contamination, anything like a thorough examination of the deeper parts of the mesentery would not be justifiable. And yet, even from the limited experience I have thus far had in applying these tests to the living subject, I cannot help feeling that the same general results may be obtained in actual operations as on the cadaver, provided, of course, that proper allowances are

made for the changed conditions.*   It does not seem probable
that localization of the different parts of the intestine can ever
be very exact, but even if it is only approximate, it is certainly
better than no localization at all.

If the imperfect outline of the subject just presented,
which is intended to be merely suggestive, proves to be the
means of calling the attention of surgeons to the desirability
of continuing this study, and in this way enabling them to
acquire fuller and more definite information which proves to
be of use on the living subject, I shall feel well repaid for my
work.

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[2] His, Archiv., 1891.
[3] Zur Kenntniss der Lage und Form des mesenterialen Theiles des Dünn-
      darmes und seines Gekröses.   Internat. Monatschr. f. Anat. und
      Physiologie, Band xi, 1894.
[4] Internat. Monatschr. f. Anat. und Physiologie, Band xiii, 1896.
[5] Development of the Human Intestine and its Position in the Adult.   Bul-
      letin Johns Hopkins Hospital, 1898, Vol. ix, p. 197.

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* Since writing the above, I have on several occasions localized loops
of intestine on the living subject, sometimes by one combination of char-
acteristics and sometimes by another, according to the case. The combina-
tion of characteristics by which one localizes an intestinal loop will, nat-
urally, vary in different cases. Knowing in any given case, from the situa-
tion of the incision, the part of the intestine I am most likely to meet with,
and, from the habit of the individual, the amount of fat which is apt to be
in the mesentery, I first get all the information I can by examining the
intestine itself, and then verify or correct my conclusions, so far as possi-
ble, by reference to the mesentery.

A FURTHER CASE OF "HOUR-GLASS" STOMACH.

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In the ANNALS OF SURGERY, May, 1902, I reported a case
of " hour-glass" stomach, which this case so much resembles
that I think it should go on record.

Miss M. A. B., aged thirty-seven years, Canadian, entered
the Montreal General Hospital, November 21, 1902. Twelve
years ago the patient was treated by the writer for gastric ulcer
of a severe type. Since then she has had to be very careful of
her diet, any indiscretion causing more or less indigestion.

Five years ago she again came under treatment, suffering
from gastric pain and inability to retain any solid food. At this
time daily gastric lavage was practised for some time, and patient
has not been troubled to any extent at any time since, up till
within two months of admission to the hospital. Then she noticed
a swelling in the upper part of her abdomen, on the left side,
appearing during the course of the day and disappearing before
the following morning. This continued with usual gastric symp-
toms till three weeks before admission, when, after a hard day's
work, she was seized with severe pain in the epigastric region,
and vomited whenever food was taken, the ingestion of which
always caused severe pain. She was unable to retain anything
but milk and soda water. The swelling remained constantly
present during part of each day, usually was absent in the morn-
ings. It was acutely sensitive to pressure, and patient was unable
to bear any tight clothing about waist.

On admission she showed marked emaciation (weight, 90½
pounds), not markedly anæmic. The abdominal examination
showed the left rectus muscle, between the costal arch and the
umbilicus, to be prominent and somewhat rigid. An indefinite,
soft mass, sensitive to pressure, was to be felt at times in this

593

region. The stomach, on distention with air, showed an undue prominence on left side, down towards the umbilicus. A diagnosis of probable "hour-glass" stomach was made and operation advised.

Patient was operated upon on November 26, 1902. Under ether anæsthesia an operation was done similar to that in the case I have previously reported. The constriction was found to be nearer the cardia than the pylorus; and above the site of the scar tissue, in the gastrohepatic omentum, a soft mass was felt, size of a walnut, which was pinkish and lobulated like pancreatic tissue, and this the pathological examination of a section showed it to be. Extending from the lower surface of the liver to the region of the cicatrix were numerous long, thin adhesions, which were divided. Gastroplasty was done as previously described, and patient made a good and rapid recovery. Her weight steadily improved; on December 25 it was 99½ pounds, February 5, 109¾ pounds.

The special interest of this case to me lies in the fact that I have had charge of her case since the inception of her trouble as a gastric ulcer twelve years ago. And being, therefore, fully cognizant of the clinical history, I gave it as my opinion that I had a case of "hour-glass" contraction to deal with before operation revealed the true condition present. In this second case the larger bulb of the stomach was the pyloric third (the reverse of the first case reported), and to this fact I attribute the more rapid and marked emaciation, the patient, of course, having less digestive area to be reached by the food.

The result in both cases continues to be excellent; both women are now in good health and attending to their duties, and both have regained their usual weight.

The following references to the literature of this subject may be interesting.

A case of "hour-glass" contraction in a woman in which the isthmus was only two inches from the cardia; also showed extremely rapid emaciation; patient lost twenty pounds in four months. A gastro-enterostomy was done in this case, and a rapid gain of thirty pounds is reported.[1]

A case similar to my first in a man is among recent records; the pyloric portion was the smaller, and the loss of weight not so marked or rapid, twenty pounds in three years. Gastro-enterostomy done, followed by a gain of twenty-two pounds in a few months.[2]

The operation of gastroplasty seems preferable, as it does not create any new and abnormal conditions, and there can be no vicious circle or regurgitation of bile into the stomach. This procedure is strongly endorsed by Mayo Robson, who reports three cases in which good results followed operation for contraction, due to adhesions in one case and ulceration and consequent cicatrization in the others. This operator employs a large bone bobbin.[3]

Cases are reported by J. Decker and A. Schmidt, in one of which gastroplasty was done for a case of median "hour-glass," in which a secondary operation for return of pain due to adhesions around operative area, with pyloric stenosis, was necessitated ten months later. A posterior gastro-enterostomy was done.[4]

In the ANNALS OF SURGERY, July, 1900, Dr. F. S. Watson, of Boston, in a most carefully written and exhaustive article, which should be read by all interested in the subject, gives a full report on all the cases of "hour-glass" stomach operated upon up to that time, giving a series of twenty-nine cases, of which seventeen were gastroplastic, with three deaths. At the time of his writing, he states that since Kruckenberg's first case of gastroplasty in 1892 there have been thirty-five cases operated on, the larger number having been done since 1896.[5] Since that time many cases have gone on record with a reduction of the mortality, following on improved technique and the selection of a method of operation which best suits the individual case. This case will add one more to the already large list of successful operations in gastric surgery.

I am much indebted to my clinical assistant, Dr. C. K. P. Henry, for help in the preparation of this paper.

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TRANSACTIONS

OF THE

NEW YORK SURGICAL SOCIETY.

Stated Meeting, May 27, 1903.

The President, Lucius W. Hotchkiss, M.D., in the Chair.

PENETRATING SHOT WOUND OF THE LUNG.

Dr. L. W. Hotchkiss presented a man, thirty-five years old, who on April 28, 1903, at five o'clock in the morning, was shot three times with a .38-caliber revolver. Fifteen minutes after the receipt of his injury he was brought to the hospital. He was in a condition of extreme shock, and was immediately put to bed, stimulated, and given a subcutaneous saline infusion. Examination showed a contusion and abrasion, about an inch long, over the right anterior spine of the ileum. A second bullet had passed through the upper third of the right forearm. The third bullet was embedded in the chest, its point of entrance being through the gladiolus, one inch above the ensiform cartilage.

Within two hours after the patient's admission, a large bulging hæmatoma had developed over the right side of the chest, in the region of the eighth rib. It measured four by six inches then, and slowly increased in size, its long diameter being parallel with the ribs and its centre in the midaxillary line. The patient complained of a feeling of oppression, and said he had difficulty in breathing. When Dr. Hotchkiss saw him, about two hours after his admission, he was still in a condition of shock, but the hæmorrhage had apparently ceased and he seemed to be slowly improving. About noon he vomited some blood. About four o'clock in the afternoon, under gas and ether anæsthesia, an exploratory laparotomy was done. An incision two and one-half inches long was made in the median line, two inches below the ensiform cartilage. There was no free blood in the peritoneal

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cavity. The stomach and intestines were moderately distended with gas. The cardiac end of the stomach was found to be normal; the pyloric end was much congested. There was no perforation of either the stomach or intestines. When this fact had been determined, the abdominal wound was closed in the usual way.

An incision seven inches long was then made over the eighth rib, through the enormous hæmatoma which had developed in that region, and a large amount of clots liberated. Two inches of the seventh rib and about four inches of the' eighth were resected in the midaxillary line. The latter rib had been perforated and shattered by the bullet. The pleural cavity was freely opened and found to contain a large amount of fluid blood and clots, but the hæmorrhage from the perforation of the lung had evidently ceased. The lower and middle lobes of the collapsed lung could be plainly seen, and it was thought, also, that the point of perforation in lung could be made out. There was also noted an abraded area over the dome of the diaphragm evidently made by the bullet. After washing out the pleural cavity with hot salt solution, the edge of the lower lobe of the lung was sutured to the parietal pleura at the posterosuperior margin of the wound, and the posterior portion of the wound was closed. Loose sterile gauze packing was inserted into the wound, but not extending into the pleural cavity. The outer dressings were changed daily on the three days following the operation. They were slightly stained with an orange-colored discharge. When the packing was removed on the second day, the pleural cavity was found to be still open, as determined by the air which was sucked in. The wound was again lightly packed with gauze. Two days later the pleural cavity was apparently closed off by wound contraction and lung expansion, and it never opened subsequently. The wound granulated from the bottom, and was strapped. The further recovery of the patient was uneventful, except for marked abdominal distention and some vomiting in the first forty-eight hours, and he was discharged cured on May 19, 1903. There was no wound suppuration, and no empyema developed. The lung expansion is now apparently normal. The bullet can be felt under the skin near the inner edge of right scapula.

DR. GEORGE WOOLSEY said it had not been his experience

that all cases of this kind treated expectantly had developed an empyema. He had treated quite a number of cases in that way, and fully 50 per cent. did not develop an empyema. They developed a hæmothorax and some signs of pleurisy, but went on to complete recovery under a simple expectant treatment. In a recent case that recovered under that method of treatment there were evidences of injury to the heart as well as the left lung, and a well-marked pericarditis developed.

DR. ALEXANDER B. JOHNSON said he had seen one or two instances where a shot wound of the thorax was treated expectantly without the subsequent development of empyema. In one of them, which he saw at Bellevue Hospital, the injury was followed by a moderate amount of pleurisy and fluid in the chest, but recovery took place without further symptoms. The speaker said he was convinced, however, that empyema would occur more frequently after the expectant method of treatment than where an open operation was done.

DR. HOTCHKISS, in closing, said that in his hospital experience nearly all the cases of penetrating shot wound of the thorax treated expectantly had developed empyema. He remembered one exception, however, that of a man who was shot apparently through the heart; at least, he was shot where his heart ought to have been. He was cyanotic and dyspnœic, almost apnœic and pulseless. The case was regarded as hopeless and nothing was done; but the man had recovered under expectant measures and there was no subsequent empyema. The judgment and nerve of the surgeon are often sorely taxed on these cases, but he thought there could be no question but that operation in many of them was a conservative and perfectly logical procedure.

MASTOID ABSCESS; THROMBOSIS OF THE LATERAL SINUS; EPIDURAL ABSCESS.

DR. HOTCHKISS presented a young man of twenty-five years, who was admitted to the hospital March 29, 1903, suffering from pain in his right ear, intense headache, dizziness, and an irregular fever. He gave a history of chronic ear suppuration for several years, with acute attacks of pain from time to time. His present illness began about two weeks before admission, with pain in the right ear and slight purulent discharge. After continuing for five days the discharge stopped, but the pain increased.

On admission his temperature was 99.6° F.; pulse, 100; respiration, 24. He complained of nausea, dizziness, and of intense pain in the ear and side of head. There was well-marked tenderness over the right mastoid process, a purulent discharge from the ear, and his expression was rather stupid. He was at once prepared for operation. Under ether anæsthesia an incision was made exposing the mastoid; the antrum was opened and connection with tympanum established. The cortex of the bone was removed and the mastoid cells down to the tip cleaned out. The sinus was deliberately exposed, and, although there was pus around it, a puncture with a small hypodermic needle withdrew fluid blood. After a thorough curettage of dead bone, the whole cavity was packed with gauze and a few sutures applied. This operation gave some relief, but the temperature ran a septic course and the intense headaches persisted. Accordingly, two or three days later the original incision was prolonged upward and forward, a flap turned back, and a trephine opening made into the cranial cavity above the temporal ridge. A small epidural abscess was found. This was evacuated, and the bone chiselled through so that it communicated with the wound below, and the abscess cavity drained. The sinus was again aspirated and fluid blood again withdrawn.

In spite of this second operation, the patient's condition was not entirely satisfactory, the septic symptoms still persisting. The lateral sinus was repeatedly tapped, and it was always found to contain fluid blood. Finally, as the wall of the sinus appeared necrotic and shrunken, he made an incision in the neck, exposed the internal jugular vein, and, after ligating it, opened and packed the lateral sinus, which contained a number of soft clots and its walls were necrotic.

After this third operation, the patient's recovery was uneventful, although he still has a small sinus which communicates with the middle ear. This sinus has since entirely closed.

CARCINOMA OF THE GALL-BLADDER.

Dr. Alexander B. Johnson presented a man, forty-four years old, who was apparently perfectly well until the first part of last winter. He had always led an active, out-of-door life. Shortly before Christmas he began to suffer pain in the region of the gall-bladder. The pain was more or less continuous, with

decided exacerbations. Subsequently, he began to suffer from attacks of vomiting; his digestion became impaired, and he began to run down in health. When he entered the hospital April 4, 1903, he had lost thirty-four pounds in weight; he was quite anæmic and markedly jaundiced. An examination of the blood showed a slight leucocytosis.

The absence of very acute attacks of pain, the more or less continuous character of the pain, and the deterioration in general health led Dr. Johnson to suspect that the case was one of malignant disease of the biliary passages or of the pancreas rather than one of stone in the common duct or of ordinary cholecystitis. No tumor could be made out in the region of the gall-bladder.

April 6, 1903, the gall-bladder was exposed through a four-inch incision. It was rather deeply situated and considerably distended, but not adherent. Upon palpation, one could feel that the third or half of the gall-bladder away from its fundus was occupied by a tumor of considerable size. In order to determine the character of this tumor, a hypodermic needle was introduced, which passed readily through the tumor mass.

The complete removal of the gall-bladder was attended with some difficulty on account of hæmorrhage from the liver, in which the gall-bladder was rather deeply embedded. The bleeding was very free, and had to be controlled by temporary packing. After removal of the entire gall-bladder, together with the malignant growth, down to a point opposite the hepatic artery, the wound in the liver was packed and a small drainage tube inserted.

After removal, the gall-bladder was opened. There was considerable thickening of its walls, and that half of the organ away from the fundus was occupied by the malignant growth; the fundus did not seem to be involved. The gall-bladder contained a few minute stones. The diagnosis of carcinoma could be made with comparative certainty from the gross appearance of the tumor. The patient made an uneventful convalescence. He had gained over twenty-five pounds since the operation, and there were no evidences of any secondary growths.

Dr. Lilienthal said he had never seen a case of carcinoma of the gall-bladder without the presence of stone, and he thought such an occurrence would be very unusual. As a rule, carcinoma developed in a contracted bladder that had held a stone for a long time, and usually in elderly people. His favorite incision in

these cases was the one which Dr. Johnson had employed, namely, between the fibres of the rectus. He thought any gall-bladder could be reached through such an incision, and was surprised to learn from witnesses and from Riedel's latest book that in Germany the enormously long incisions were still favored. Mikulicz, during a recent visit to Mt. Sinai Hospital, had told the speaker that he was not in favor of the long preliminary incision. Riedel favors a preliminary incision of from thirty to thirty-five centimetres, and states that if necessary another incision can be made inward, completing a trap-door flap.

Dr. Johnson said it had always seemed to him that a very large incision in gall-bladder work was rather a disadvantage than otherwise. With a moderate-sized incision it was easier to keep the viscera out of the way, while with a very large incision it was necessary to put in a great many pads. Furthermore, with a large incision the amount of shock was greater, the wound required more manipulation, and it lengthened the time of the operation. In operating on the kidney, either for the purpose of removing the organ or even for the removal of stone in the kidney, Dr. Johnson said he was in favor of a pretty large incision parallel to the ribs. This enables the operator to see what he is doing; it brings the pedicle into view, and there is no difficulty in ligating the vessels.

REMOVAL OF THE SCAPULA FOR SARCOMA.

Dr. H. Lilienthal presented again a patient who was first shown by him at a meeting of the Society several months previously. It was presented then as a case of small round-celled sarcoma of the right scapula, which had apparently greatly diminished in size under the use of the X-ray and injections of Coley's fluid, the treatment being continued over several months. A few days after that meeting, signs of a recurrence of the growth became manifest, and the entire scapula, with the exception of the glenoid process, was removed. At the next meeting of the Society, the specimen had been presented.

About two months had elapsed since the operation. The wound healed by first intention, and the patient made an uninterrupted recovery. On account of the fact that there was considerable pigmentation and thickening of the skin as the result of the X-ray treatment, one of the gentlemen who discussed the

case at the previous meeting suggested that the operation might be followed by gangrene of the skin, but such a complication did not occur in this instance.

THE DIAGNOSIS AND TREATMENT OF ACUTE PANCREATITIS.

DR. GEORGE WOOLSEY read a paper with the above title, for which see ANNALS OF SURGERY for November.

DR. LILIENTHAL referred to a case of acute pancreatitis which he had presented to the Society about five years ago. The patient was a man of fifty-two years, who had always been temperate in his habits. For three or four days before coming under observation, he had complained of symptoms which were looked upon as the result of an extremely acute attack of suppurative cholecystitis. When he was brought to the hospital he was cyanotic, and his general condition was such that recovery seemed out of the question. A large incision was made beside the right rectus, which revealed the fact that the gall-bladder was practically normal. The omentum and mesentery, especially the latter, were studded with large and small whitish plaques, perfectly circular in outline. One of these was excised and examined, and it proved to be a typical fat necrosis. The pancreas was thereupon exposed, and its head was found to be enormously enlarged, fully as large as an adult fist, and very firm and elastic. An aspirating needle was inserted, and fully two ounces of pure fluid withdrawn. At this stage of the operation the patient's condition became so critical that the wound was closed as rapidly as possible.

The man recovered, but he subsequently developed a ventral hernia, for which he was operated on by Dr. Lilienthal a week ago. The pancreas was palpated and found to be surrounded by numerous adhesions. Both the pancreas and gall-bladder were apparently of normal size. The head of the pancreas, which at the time of the first operation was enormously enlarged, had regained its normal size.

Dr. Lilienthal said he agreed with Dr. Woolsey that acute pancreatitis was undoubtedly a surgical disease, but he did not agree with him that the condition was easily recognized. On the contrary, as far as our present knowledge went, it was difficult to recognize. It might be mistaken for either acute intestinal obstruction or acute cholecystitis. Dr. Gerster had recently oper-

ated on a case of apoplexy of the pancreas, but the condition was not recognized until the abdomen was opened; until that time the trouble was supposed to be in the kidney. The actual number of cases of acute pancreatitis in which the condition had been recognized prior to operation was very small. Nevertheless, the picture presented in all these cases was one of acute. grave intra-abdominal lesion, and operative interference was indicated.

DR. JOHN F. ERDMANN said that in one case that had been diagnosticated as acute cholecystitis he opened the abdomen and found 2060 small stones in the gall-bladder. The mesentery was studded with many small, white, rounded plaques, which proved to be areas of fat necrosis. The abdominal cavity was filled with a brownish-colored fluid resembling beef broth. The patient died within thirty-six hours.

Dr. Erdmann said that while we were gradually learning more about this condition of acute pancreatitis, its diagnosis could not be regarded as easy. Among other conditions, it was difficult to distinguish it from ultra-acute appendicitis and acute cholecystitis.

DR. L. W. HOTCHKISS reported the following case of acute pancreatitis, which, prior to operation, was simply recognized as one of probable peritonitis of unknown origin. The patient was a young woman who had been recently confined. So far as could be learned, her confinement had not been followed by any septic complication. She was suddenly seized with pain, vomiting, and symptoms of intestinal obstruction, with considerable abdominal distention, and in this condition she was brought to the hospital. The case did not seem like one of appendicitis.

Upon opening the abdominal cavity it was found to be filled with fluid, seropurulent in character and mixed with flakes of fibrin. Upon washing this out the omentum and mesentery were found to be studded with little white plaques, which proved to be areas of fat necrosis. After washing out the abdominal cavity thoroughly with salt solution, the wound was closed. After several days of very severe illness, during which her symptoms, *i.e.*, pain and tenderness, seemed to localize in the epigastrium and left hypochondrium, the patient recovered. She left the hospital perfectly well and has remained so.

DR. WOOLSEY, in closing, said that pronounced cyanosis had

been seen in some cases of acute pancreatitis, but not in all. In his own cases, the symptom was not pronounced. The pulse was rather more rapid and the condition of collapse more marked than in fulminating appendicitis.

Dr. Woolsey said he did not claim that the diagnosis of acute pancreatitis was an easy matter. In the severe acute forms it was less difficult than in the less acute or subacute forms. In a certain proportion of cases the diagnosis was fairly probable, and if, after incision, areas of fat necrosis were discovered, the diagnosis could be regarded as positive. In two cases seen by Dr. Bevan, of Chicago, the pancreas was not noticeably enlarged. Fat necrosis was almost invariably due to disease of the pancreas.

CORRESPONDENCE.

HERNIA OF THE URINARY BLADDER.

EDITOR ANNALS OF SURGERY.

HERNIA of the urinary bladder is sufficiently rare to make the following report interesting and valuable from the statistical stand-point.

Mrs. A., aged seventy-two years, was suddenly seized with severe pain in the right inguinal region, associated with nausea and vomiting. The vomitus, at first mucus and bile, later became slightly fæcal in character.

Dr. Gresham, of Sierra Madre, made an early diagnosis of strangulated hernia, and urgently advised operation. This was not consented to until gradually intensifying symptoms of strangulation, after twenty-four hours, led to surgical consultation, which fully concurred in the diagnosis and the necessity for immediate operation if life was to be saved.

An operating room was hastily prepared in the patient's home, a comfortable ranch house, and, assisted by Dr. George E. Abbott and two trained nurses from the Pasadena Hospital, I proceeded to operate.

The structures overlying the hernial sac were much attenuated, and my incision brought me at once to the œdematous and deeply congested sac. The constriction at the internal abdominal ring was first relieved. The sac was then opened and found to contain a loop of small intestine almost black, its peritoneal coat already lustreless and beginning to desquamate.

The use of repeated hot compresses so far restored the circulation that it was deemed safe to return the knuckle of gut to the abdominal cavity.

I next transfixed the sac at its exit from the internal abdominal ring with chromicized catgut and ligated both ways. In doing so, I was impressed with the thickness of the inner wall of the sac, but did not grasp its true significance until the sac was excised.

After snipping off the sac close to the internal ring, I endeavored to tuck the stump back into the abdomen, whereupon a clear yellow fluid welled up from the wound. The odor was distinctly urinous. The bladder was then sought for at the inner margin of the wound and grasped with forceps. When brought into plain view, an opening the size of a silver dollar was found in it.

The aperture was closed by two rows of catgut sutures. The first penetrated the entire thickness of the bladder-walls. The second row of Lembert sutures rolled in the serous surfaces and re-enforced the first row of sutures.

The bladder was now carefully tucked back into its proper location and the hernial opening closed after the Bassini method. A strand of catgut in contact with the line of suture in the bladder-wall was brought out at the lower angle of the skin incision.

A self-retaining catheter was introduced into the bladder, and continuous drainage practised for one week. The sutures were then removed from the skin wound, which had healed primarily, and the catheter was also removed after testing the bladder for irrigation. Four ounces of boracic acid solution were several times forced into the bladder by gravity, and the entire quantity recovered each time without discomfort to the patient.

Recovery was complete and uninterrupted, save by a mild cystitis.

CHARLES D. LOCKWOOD, M.D.

PASADENA, CALIFORNIA.

THE EXPOSURE OF THE POSTDUODENAL PORTION OF THE COMMON BILE DUCT.

EDITOR ANNALS OF SURGERY.

I NOTICE in the September number of the ANNALS a letter from Dr. C. M. Cooper describing shortly a new method of reaching the postduodenal portion of the common bile duct. The method is thoroughly practical and useful. In the *Revue de Chirurgie,* June, 1896, Professor Vautrin, of Nancy, gives a very full and clear description of the procedure and an account of its use in several cases.

J. F. BINNIE.

KANSAS CITY, MO.

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